After Action Report

Bartlo Packaging Systems, Incorporated
Pesticide Warehouse Fire

West Helena, Arkansas
May 9-13, 1997

Bartlo Packaging Systems, Incorporated
West Helena, Arkansas

AFTER ACTION REPORT

PURPOSE

On the evening of May 8, 1997, Dr. Tom McChesney, state epidemiologist with the Arkansas Department of Health (ARDOH), requested on-site assistance from the Agency for Toxic Substances and Disease Registry (ATSDR). The purpose of the on-site assistance was to provide technical support and assistance to the ARDOH in addressing public health issues associated with a pesticide warehouse fire at the Bartlo Packaging Systems (BPS) facility in West Helena, Arkansas, which had started earlier that afternoon.

Ron Zabrocki and Scott Wright, ATSDR emergency response coordinators, arrived on the scene at 9:30 AM on May 9, 1997. The fire at the warehouse was smoldering and the general evacuation in the vicinity of the fire had been lifted, but the Helena Regional Medical Center (HRMC) remained evacuated since the previous afternoon (see Appendix A for photos and map). The public health issues raised by ARDOH included decontamination and reoccupation of the hospital, decontamination of homes and household items, decontamination of food products, and potential health effects from exposure to the smoke.

BACKGROUND

On Thursday, May 8, 1997, an explosion and fire occurred at the BPS facility in West Helena, Arkansas. The BPS facility included a pesticide formulation plant and a product warehouse. The explosion and fire occurred at the warehouse at approximately 1 PM local time. The warehouse and the formulation plant were evacuated without any employee injuries. West Helena fire fighters responded to the incident. During the fire fighter response, the explosion resulted in the death of three fire fighters after a cinder block warehouse wall collapsed. Initially, the three chemicals thought to be stored in the warehouse were azinphos-methyl, methomyl, and thiophanate. Later, investigators determined that other chemicals—including Topsin, Alliette, Lannate, Premise, Procure, Sevin, Signature, Maneb, Penncozeb, CR blend, Powmyl, Termil, and Lorsban—may have been present in the warehouse.

Within 30 minutes of the explosion, the HRMC, a 110-bed hospital located about 1.5 miles southeast of the BPS facility, began evacuating 44 patients. The acutely ill patients were transferred to hospitals in Clarksdale, Mississippi, and Forrest, Arkansas. A newborn was airlifted to Memphis, Tennessee. The remaining patients were either released or transported to various nursing homes in the area. Emergency medical services were relocated to the community college.

A general evacuation of the area and shelter-in-place strategies were implemented by the Helena and West Helena fire departments up to a 3-mile radius surrounding the BPS facility. Residents

returned to their homes after the 7-hour evacuation.

PUBLIC HEALTH ISSUES

ATSDR and ARDOH addressed the following public health issues: 1) acceptable exposure levels to the chemicals involved, 2) reoccupation of HRMC, 3) decontamination of businesses and residences, and 4) consumption of exposed food products.

Sensitive populations were identified as individuals with preexisting cardiopulmonary conditions, infants, and pregnant women. The individuals with cardiopulmonary conditions could be further affected by the irritant nature of the smoke.

Monitoring of blood cholinesterase activity for organophosphate exposures, as part of the medical surveillance program, was recommended for symptomatic fire fighters and response workers. Dimethylthiophosphate (DMTP) in urine is a biomarker for exposure to azinphos-methyl. It was recommended that concerned citizens, fire fighters, and response workers have urine specimens collected and analyzed for DMTP. If DMTP was found in the urine of any private citizens, then blood cholinesterase activity should be monitored.

The lack of an adequate health facility for the area was a primary concern of the ARDOH and the U.S. Environmental Protection Agency (EPA). A gunshot incident in the West Helena community strained the temporary emergency facilities located at the local community college. ATSDR, with input from the ARDOH on-site representatives and HRMC administration, safety, and facility staff, focused on the steps to safely reoccupy the facility. The final reoccupation strategy included six steps: 1) Ventilating the HRMC complex with maximum air exchange, 2) Analyzing the indoor air quality using a photo-ionization detector and a flame ionization detector, 3) Collecting indoor air samples for gas chromatographic analysis for azinphos-methyl contamination by the Army's Pine Bluff Arsenal monitoring team, 4) If results of analysis of samples showed no contamination, directing hospital staff to re-enter complex to complete a thorough cleaning of the facility, 5) Replacing the air filters in the heating, ventilation, and cooling system, and 6) Reoccupying the facility with patients. The hospital was scheduled to open for patients at 6 PM on May 13, 1997.

Additional concerns centered around the decontamination issues associated with food product and hard environmental surfaces such as playground equipment and athletic playing fields. With the cooperation of the hospital infection control/safety officer and the local health department, a written procedure was developed concerning decontamination issues of food product and environmental surfaces in businesses and residences.

Community concerns included the safety of the drinking water supplies. Most of the homes were serviced by a community water system that obtains groundwater from a series of wells that are 600 feet deep. The Arkansas Department of Pollution Control and Ecology collected point-of-entry water samples from the community water system wells. The impact of the event on

individual wells was minimal because the runoff water from the fire fighting efforts was contained on-site, and no drinking water wells were in the vicinity of the industrial complex that included the BPS facility.

On May 11, 1997, on-site environmental air monitoring at the BPS facility indicated the presence of cyanide gas, which was thought to have been released from the smoldering fire or the fractionation tanks. ATSDR downloaded chemical-specific information on the pesticides involved in the fire and developed a matrix of the incompatibilities of all the pesticides including potential by-products (see Appendix B). This matrix was discussed with the EPA on-scene coordinator (OSC) and the EPA/Occupational Safety and Health Administration (OSHA) fire investigation team.

For more complete information, see the daily Situation Reports in Appendix C and the Record of Activity reports in Appendix D.

CONCLUSIONS

On the basis of the toxicology of the chemicals involved and the maximum contaminant levels detected in and around the businesses and residences, no long-term public health effects are expected from the BPS fire and explosion. Public health concerns by the community continue and are being addressed by state and local health officials with support from ATSDR.

RECOMMENDATIONS

ATSDR will continue to support the ARDOH and the local health department with any public health concerns related to the fire and the subsequent clean-up.

PRINCIPAL CONTACTS

Jim Mullins, Emergency Response and Removal Branch, EPA Region VI
Mike Ryan, EPA Region VI OSC
Ky Nichols, EPA Region VI OSC
Lon Biasco, EPA Region VI OSC
Craig Carroll, EPA Region VI OSC
Steve Mason, EPA Region VI, Chemical Emergency Preparedness and Prevention Office (CEPPO)
Awilda Fuentes, EPA Headquarters, CEPPO
Maxine Lapierre, EPA contractor, Region VI, Dallas, TX
Richard Bossey, EPA contractor, Region VI, Dallas, TX
Mike Marshall, OSHA HQS/Health Response Team (HRT), Washington, DC
Allan Heins, OSHA, Salt Lake City Technical Center, UT

LTC Anderson, Commander, Pine Bluff Chemical Arsenal, AR
Ronald Wise, Chief, Laboratory, Pine Bluff Chemical Activity, AR
Michael Isner, Sr. Fire Investigator, National Fire Program Administration, Quincy, MA
Dr. Tom McChesney, ARDOH, State Epidemiologist
Bill Teer, Director, Environmental Health Protection, ARDOH
Kay Dobbins, ARDOH Associate Director, Environmental Science
Mike Forman, ARDOH Laboratory Director
James Miller, Engineer, Division of Health Facilities, ARDOH
Bruce Redinger, Architect, Division of Health Facilities, ARDOH
Sue Castell, ARDOH
Mike Watts, ARDOH
Fred Fowler, ARDOH
James Duffy, Sanitarian Supervisor, ARDOH, Forrest City, AR
David Bellew, Manager, Hazardous Materials, Office of Emergency Services, AR
Donald R. Gentry, Phillips County Judge, Helena, AR
Mike Cunningham, Phillips County Emergency Management, Helena, AR
Shirley Hicks, Administrator, Phillips County Health, Helena, AR
Cheryl Anthes, Nurse, Community Health, Phillips County
Charles Maggio, Coordinator, Search & Rescue, Phillips County
Riley Porter, Mayor, West Helena, AR
Pat Sensat, Fire Chief, West Helena, AR
Steve Reeder, Administrator, HRMC
Betsy Arnold, Director of Laboratory, Safety/Infection Control, HRMC
Richard Cox, Director of Plant Operations, HRMC
Angela Cousins, Renal Care Group, Dialysis Center
Larry Thompson, Bayer Chemical, TransCAER Responder
Bill Hubbs, Manager, Emergency Response, Rhone-Poulenc Chemical, Research Triangle Park, NC
Joe Deptman, Chemical Manufacturers Association (CHEMTREC)
Tim Davy, Kroger Supermarkets
Eddie Smith, Unified Investigations & Sciences, Norcross, GA
Chris Buehler, Failure Analysis Association, BPS Contractor
Dr. Bobby Gunter, CIH, Consultant, Hartford Insurance, Atlanta, GA
Allan Bartlo, President, BPS

Appendix A

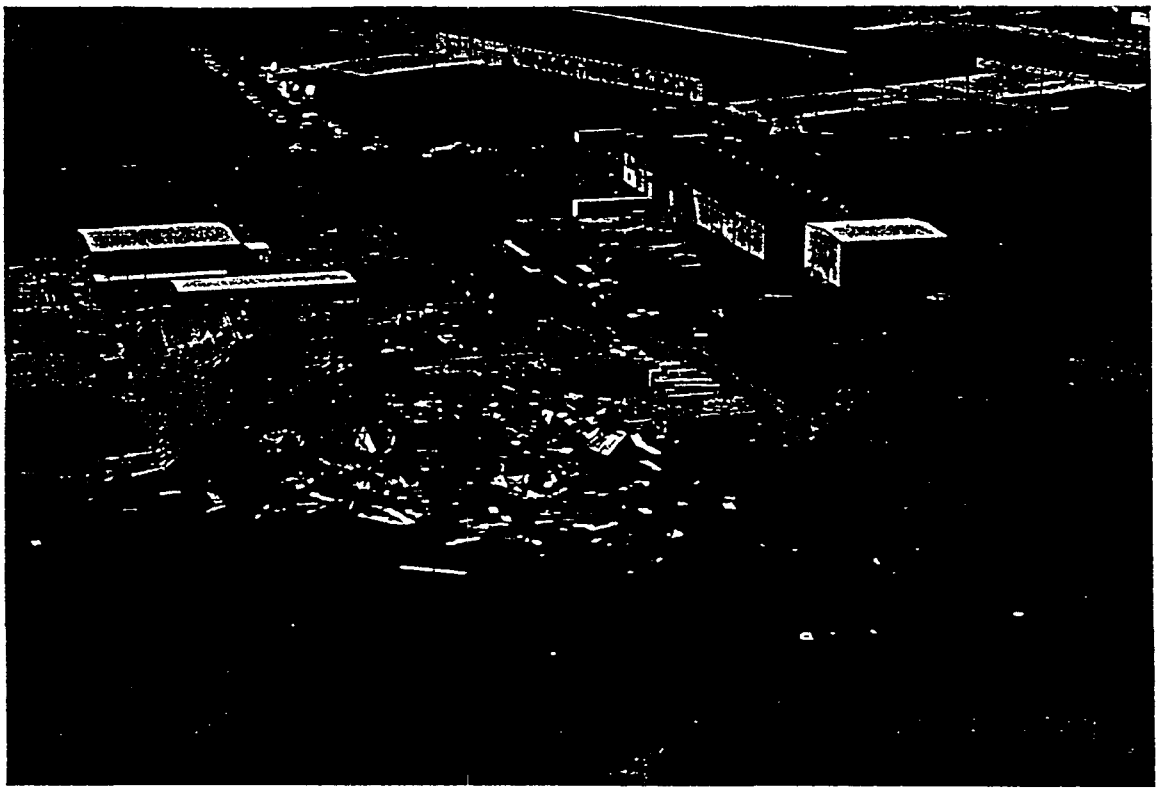
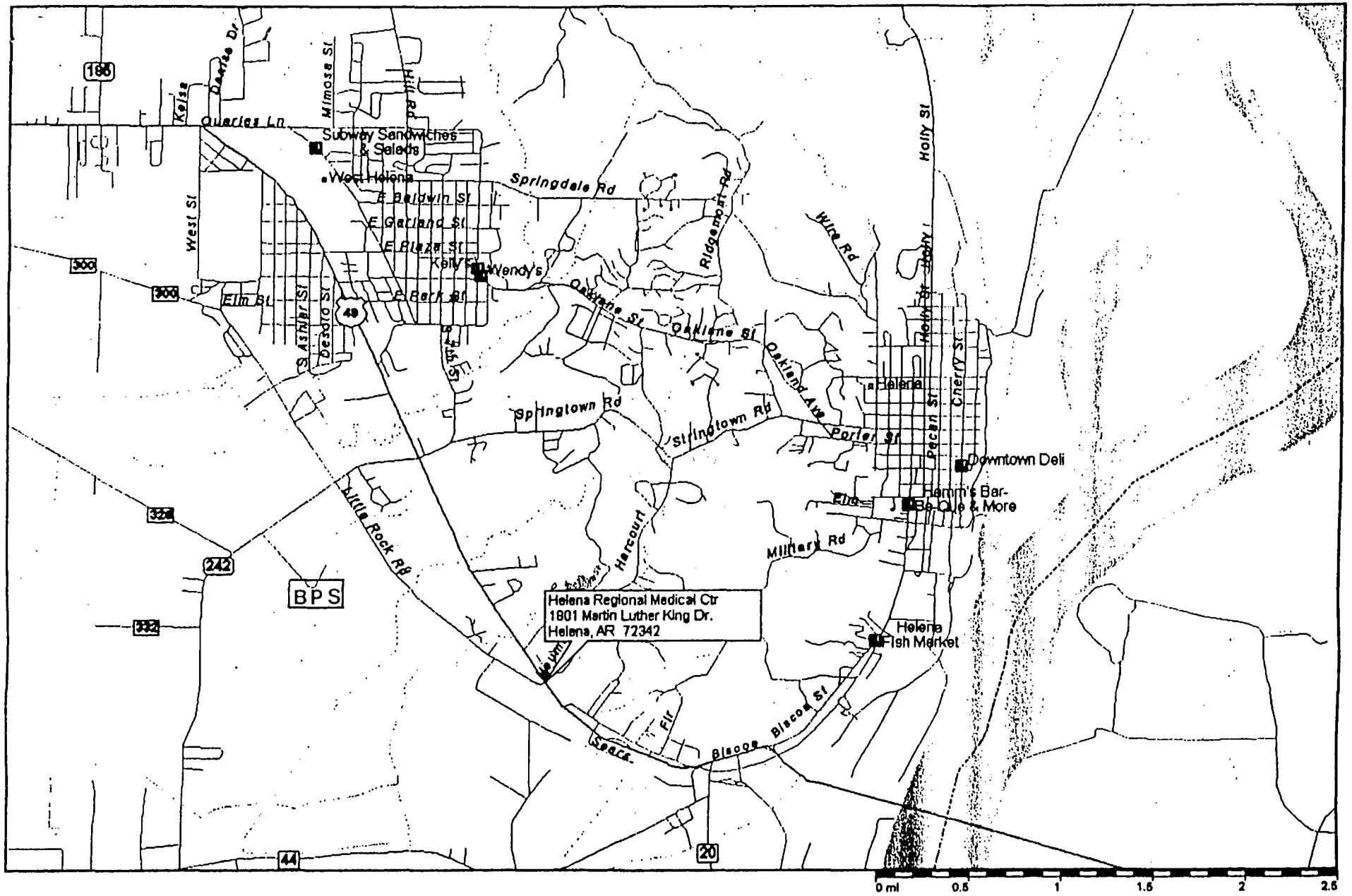


Photo: BPS Warehouse Fire, West Helena, Arkansas, May 1997



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Appendix B

BPS CHEMICALS REACTIVIES

Inventory Name	Also Called/Active Ingredient	Vol. (Lbs.)	Molecular Formula	Reacts with	Comments
Azinphos-methyl	Guthion	30K	$C_{10}H_{12}N_3O_3PS_2$	Pyrethroids (tox. syngerism) & oxidizers	Product burned 5/8.
Topsin	Thiophanate	30K	$C_{14}H_{18}N_4O_4S_2$	No Data	
Aliette		50K	$C_6H_{18}O_9P_3$ - Al	Alkaline Fertilizers	
Lannate	Methomyl	60K	$C_5H_{10}N_2O_2S$	Bases	
Premise	15 separate formulations with that name	Unk.	Mix of OP, Carbamates, & Pyrthrins		
Procure	Triflumizole	20K	$C_{15}H_{15}ClF_3N_3O$		
Sevin	Carbaryl	5K	$C_{12}H_{11}NO_2$	Alkaline Pesticides & Oxidizers	May produce cyanides
Signature	Sodium Hypochlorite	3K	NaClO	Strong Oxidizer that reacts violently with nitrates and hydrocarbons	May be initiating current reactions
Maneb		1K	$C_4H_6MnN_2S_4$	Spontaneously Combustible; Water reactive; decomposes violently at 100 C.	May be initiating current reactions; possible cause of explosion; may have burned on 5/10
Penncozeb	Mancozeb	Unk.	$C_4H_6MnN_2S_4$ mixed with $C_4H_6N_2S_4Zn$	Heat & moisture; otherwise similar to Maneb	May be initiating current reactions.
CR Blend	39 Compounds with CR in name; 3 Pesticides are Carbofuran-based (2) or Warfarin-based (1)	200	Carbofuran: $C_{12}H_{15}NO_3$ or Warfarin: $C_{19}H_{16}O_4$	Similar reactivities: oxidizers & alkalines	Carbofuran may produce cyanide
Powicil		2K	---------NO--------	----------DATA----------	----------
Terinil		200	---------NO--------	----------DATA----------	----------
Lorsban	Chlorpyrifos	1K	$C_9H_{11}Cl_3NO_3PS$	Acids, Caustics, & Amines	

INTERIM ANALYSIS

Products of reaction and/or thermal decomposition include oxides of phosphorous, nitrogen, carbon, and sulfur, inorganic chlorine compounds (e.g., Cl, HCl, HClO, etc.), ammonia and amines possibly; cyanides and hydrogen cyanide primarily from Sevin and, if present, the Carbofuran (Furadan) formulations of CR blend. The initiators of most reactions would be the Maneb and/or Penncozeb or the Signature, as they are reactive with almost all the other compounds. If these three compounds can be removed from the pile, it is our belief that most reactions will cease. The violent decomposition of Maneb (and possibly Penncozeb) at 100 degrees C may have contributed to the explosion. The remaining compounds could form a significant amount of nitrate/nitrite in solution, resulting in the low pH of the firefighting runoff.

Additional information should be obtained on the Powicil and Terinil compounds, no data was available on these compounds. There are 39 compounds in the CC Info data base with CR as a component of the name, but only 3 seem to be registered pesiticides. Further clarification on the formulation of the CR blend would be advisable as some of the other 36 compounds are chromate and dichromate compounds, usually significant oxidizers. There are 15 pesticides with Premise in their name. They are various mixtures of carbamates, organophosphates, and pyrethroid (both synthetic and natural) pesticides; overall, they would be expected to conform to the other carbamates and O.P.s already known to be present. However, there may be subtle but significant differences in their molecular structure, which would affect whether we are dealing with- for instance - nitrates, cyanides, or amines.

MATERIAL SAFETY DATA SHEET

SECTION 1 - MANUFACTURER INFORMATION

MANUF/DIST: MICRO FLO CO.
P. O. Box 5948
Lakeland, FL 33807

EMERGENCY PHONE: (800) 424-9300

TRADE NAME/SYNONYMS	:	AZINPHOS METHYL 50W SOLUBLE
CHEMICAL NAME/SYNONYMS:		See Hazardous Ingredients Below
CHEMICAL FAMILY	:	Organophosphorus Insecticide
FORMULA	:	$C_{10}H_{12}N_3O_3PS_2$
PRODUCT CODE	:	Reg. # 51036-164

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM (HMIS)

*	HEALTH 2	*
*	FLAMMABILITY . .0	*
*	REACTIVITY . . .0	*
*	PROTECTION . . .2	*

SECTION 2 - HAZARDOUS INGREDIENTS

THIS PRODUCT CONTAINS HAZARDOUS INGREDIENTS: Yes

CHEMICAL NAME	CAS NUMBER	%	PEL-OSHA	TLV-ACGIH
Azinphos methyl	86-50-0	50.0	(skin)	0.2mg/m3
Inert ingredients		50.0		
	Total:	100.0%		

THIS PRODUCT CONTAINS CARCINOGENS (NTP, IARC, or OSHA): NO

SECTION 3 - HEALTH HAZARD DATA

HEALTH EFFECTS (Acute and Chronic):
(LD50 Values for azinphos methyl technical)

Acute Oral LD50 (rat)	=	13-16 mg/kg
Acute Dermal LD50 (rat)	=	> 220 mg/kg
Acute Inhalation	=	0.09 mg/l

MAY BE LETHAL IF INHALED, SWALLOWED OR ABSORBED THROUGH SKIN

PRIMARY ROUTES OF ENTRY:
Poisonous if swallowed, inhaled, or absorbed through skin. Rapidly absorbed through skin surfaces & eyes. Contaminated clothing must be removed immediately. Exposed persons must receive prompt medical treatment.
Physician Note: This product is a strong cholinesterase inhibitor.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:
Low cholinesterase levels.

SIGNS & SYMPTOMS OF POISONING:
Headaches, nausea, vomiting, cramps, weakness, blurred vision, pin-

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point pupils, tightness in chest, labored breathing, nervousness, sweating, watering of eyes, drooling or frothing of mouth & nose, muscle spasms, and coma.

EMERGENCY FIRST AID PROCEDURES:
Call a doctor (physician), clinic, or hospital immediately. Explain that the victim has been exposed to azinphos methyl & describe his condition. If the doctor cannot come, take the victim to a hospital or clinic at once.
IF INHALED:
Remove victim to fresh air. If not breathing, give artificial respiration, preferably mouth to mouth, & maintain until doctor sees victim. If breathing is difficult, give oxygen.
IF IN EYES OR ON SKIN:
Immediately flush with plenty of water for 15 mins. while removing contaminated personal clothing & shoes to avoid continued possible exposure.
IF SWALLOWED:
Induce vomiting immediately by giving 2 glasses of water & touching back of throat with finger. Do Not Induce Vomiting Or Give Anything By Mouth To An Unconscious Person. Have victim lie down & keep quiet.
NOTE TO PHYSICIAN: Antidote - give atropine sulfate in large doses. TWO to FOUR mg. intravenously or intramuscularly as soon as cyanosis is overcome. Repeat at 5-10 min. intervals until atropinization signs appear. 2-PAM chloride may be administered as an adjunct to, but not substitute for atropine. DO NOT GIVE MORPHINE OR TRANQUILIZERS BECAUSE THESE MAY ACCENTUATE PHARMACOLOGIC EFFECT OF THIS PRODUCT.

SECTION 4 - CHEMICAL DATA

BOILING POINT (F)	: N/A
SPECIFIC GRAVITY (WATER=1)	: See*
VAPOR PRESSURE (mmHg)	: N/A
PERCENT VOLATILE BY VOLUME	: N/A
VAPOR DENSITY (AIR=1)	: N/A
EVAPORATION RATE (butyl acetate=1)	: N/A

*Packed Bulk Density 30-35 lbs/ft3

SOLUBILITY IN WATER:
Wets & suspends

APPEARANCE AND ODOR INFORMATION:
Fine, light yellowish powder with a "rotten cabbage" odor.

SECTION 5 - PHYSICAL HAZARD DATA

FLASH POINT (Method Used): N/A
FLAMMABLE LIMITS: LEL - N/A UEL - N/A

EXTINGUISHING MEDIA:
Small Fires: Dry chemicals, CO2, Halon, water spray or foam.
Large Fires: Water spray, fog or standard foam is recommended.

SPECIAL FIRE FIGHTING PROCEDURES:
NIOSH self contained breathing apparatus (SCBA). Fight fire

upwind. Stay away from tank ends. For LARGE fires: Dike area to prevent runoff. Fight fire from maximum distance. Wear chemical protective clothing.

UNUSUAL FIRE AND EXPLOSION HAZARDS:
Vapors and fumes from fire are hazardous. Use mist if possible to avoid dispersing powder. Evacuate people located downwind from fire.

INCOMPATIBILITY (Materials to avoid):
Alkaline materials.

HAZARDOUS DECOMPOSITION PRODUCTS:
Toxic gases and vapors such as sulfur dioxide, oxides of nitrogen, phosphoric acid mist, and carbon monoxide, may be released in a fire involving this product.

WILL HAZARDOUS POLYMERIZATION OCCUR:
Has not been known to occur under normal conditions.

IS THE PRODUCT STABLE:
Under normal conditions.

CONDITIONS TO AVOID FOR STABILITY:
High temperatures may cause hazardous vapors. Avoid contact with strong oxidizers or alkaline substances.

SECTION 6 - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:
Use self contained breathing apparatus & full protective clothing.
Large Spill: Dike far ahead of material in case of rain. Keep out of bodies of water.
Small Spill: can be taken up and placed in properly labeled containers for later disposal.

WASTE DISPOSAL METHODS:
Azinphos is an acutely hazardous waste. Dispose in accordance with State and Federal authorities in compliance with RCRA regulations.

CONTAINER DISPOSAL:
Completely empty bag into application equipment. Then dispose of empty bag in a sanitary landfill or incinerate, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.

SECTION 7 - EXPOSURE CONTROL INFORMATION

VENTILATION:
Required for handling indoors with localized exhaust recommended

RESPIRATORY PROTECTION:
For exposure in enclosed areas, use a respirator with either an organic vapor removing cartridge with a prefilter approved for pesticides (MSHA/NIOSH approval number prefix TC-23C), or a canister approved for pesticides (MSHA/NIOSH approval number prefix TC-14G)
For outdoor exposure, use a dust/mist filtering respirator

(MSHA/NIOSH approval number prefix TC-21C)

PROTECTIVE GLOVES:
Waterproof

OTHER PROTECTIVE EQUIPMENT:
Chemical-resistant footwear plus socks
Protective eyewear such as safety goggles or a face shield
Chemical-resistant headgear for overhead exposure
Chemical resistant apron when cleaning equipment, mixing, or loading
Coveralls over short-sleeved shirt and short pants

Discard clothing and other absorbent materials that have been drenched or heavily contaminated with this product's concentrate. Do not reuse them. Follow manufacturer's instructions for cleaning and maintaining PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE seperately from other laundry.

USER SAFETY RECOMENDATIONS
1. Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet
2. Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing
3. Remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing

WORK PRACTICES:
REPEATED EXPOSURES TO CHOLINESTERASE INHIBITORS SUCH AS AZINPHOS METHYL MAY WITHOUT WARNING, CAUSE PROLONGED SUSCEPTIBILITY TO VERY SMALL DOSES OF ANY CHOLINESTERASE INHIBITOR. Persons working with this product should have frequent blood tests of their cholinesterase levels. If it falls below a critical point, no further exposure should be allowed until it has been determined by blood tests that it has returned to a normal level. Keep all unprotected persons & animals away from treated area or where there is a danger or drift. Do Not rub eyes or mouth with hands. If you feel sick in any way, STOP work and get help right away.

SECTION 8 - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE:
Store in a cool, dry well-ventilated place. Do not store near heat or open flame. Keep out of reach of children. STORE IN ORIGINAL CONTAINERS ONLY. DO NOT USE OR STORE IN OR AROUND HOME. Empty container retains product residue. Observe all labeled safeguards until container is disposed in accordance with state and local laws.

MAINTENANCE PRECAUTIONS:
Wear full protective clothing when working on equipment that has been used to apply or package this product. Residues left in equipment are extremely hazardous.

OTHER PRECAUTIONS:
Respirators should be cleaned & cartridges replaced according to

instructions included with respirators. Replace gloves frequently. Refer to product label for further precautions regarding reentry and worker warnings

ADDITIONAL COMMENTS:
To the best of our knowledge, the information contained herein is accurate. However, Micro-Flo does not assume any liability for the accuracy or completeness of the information. Final determination is the sole responsibility of the user.
SEGREGATE FROM FOOD, FEEDSTUFFS, & CLOTHING (49CFR 177.841)

SECTION 9 TRANSPORT INFORMATION

D.O.T. Proper Shipping Name (49CFR 172.101): Organophosphorus Pesticides, Solid, Toxic, N.O.S. (Contains Azinphos Methyl)
D.O.T. Hazards Class: 6.1
UN/NA Number: UN2783
Packing Group: PG II
Label(s) Required: Primary - Poison
Subsidary - NA
Placard(s) Required: Primary - Poison
Subsidary - NA
Emergency Response Guide: #55

SECTION 10 REGULATORY INFORMATION

CERCLA Reportable Quantity: #1
RCRA Status: Not Regulated
SARA TITLE III:
Section 302 Extremely Hazardous Substance: YES
Section 311 Hazard Categories: Immediate
Section 313 Toxic Chemicals: NO

Revision: 1/95

DuPont Agricultural Products

M0000060 Revised 18-NOV-1995 Printed 18-DEC-1995

"Lannate" Insecticide

CHEMICAL PRODUCT/COMPANY IDENTIFICATION

Material Identification
"Lannate" is a registered trademark of DuPont.

Corporate MSDS Number DU003803

Grade A 90% FORMULATION

Tradenames and Synonyms
"Lannate" 90-WD
90-WD

Company Identification
MANUFACTURER/DISTRIBUTOR
DuPont
1007 Market Street
Wilmington, DE 19898

PHONE NUMBERS
Product Information 1-800-441-7515
Transport Emergency CHEMTREC 1-800-424-9300
Medical Emergency 1-800-441-3637

COMPOSITION/INFORMATION ON INGREDIENTS

Components

Material	CAS Number	%
METHOMYL	16752-77-5	90
(S-METHYL-N-[(METHYLCARBAMOYL)OXY]THIO-ACETIMIDATE)		
INERT INGREDIENTS		10

(Continued)

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400 ppm; no effect level (NOEL) of 100 ppm based on slight hemolytic anemia and/or body weight effects observed at the higher dietary concentrations. No compound related neoplastic lesions were observed.

2-year feeding in mice: Feeding levels 0, 50, 75, and 200 ppm; no compound related neoplastic or non-neoplastic histologic effects were found at any level. The NOEL was considered to be 50 ppm based on transient hemolytic anemia and increased mortality at the higher dietary concentrations.

2-year feeding in dogs: Feeding levels 0, 50, 100, 400, and 1,000 ppm. The NOEL of 100 ppm was based on hemolytic anemia and non-neoplastic changes within the kidney and spleen at the higher dietary concentrations. There were no neoplastic effects at any dose.

REPRODUCTION

Three-generation rat reproduction study at dietary rates of 50 and 100 ppm showed no adverse effect upon fertility, and no compound related histologic effect. A 2-generation rat study conducted at 75, 600, and 1,200 ppm in the diet showed similar results.

TERATOGENICITY

In rats, no embryotoxic or teratogenic effects were observed at levels up to 400 ppm (highest level fed). In rabbits, the highest dietary dose level (equivalent to 100 mg/kg body wt.) did not cause any observed compound related abnormalities.

MUTAGENICITY

Methomyl was negative in numerous assays to evaluate mutagenicity and genotoxicity, including Ames test, Reverse Mutation Assay, Recessive Lethal Assay, three DNA damage studies, an unscheduled DNA Synthesis Assay, and in vitro and in vivo cytogenetic assays.

ACCEPTABLE DAILY INTAKE

Based on the 100 ppm no-observable effect level of the 2-year dog feeding study, and utilizing a 100 fold safety factor, the U.S. EPA has established an Acceptable Daily Intake of 0.025 mg per kilogram of body weight per day.

Carcinogenicity Information

None of the components present in this material at concentrations equal to or greater than 0.1% are listed by IARC, NTP, OSHA or ACGIH as a carcinogen.

(Continued)

FIRE FIGHTING MEASURES (Continued)

Extinguishing Media
Water Spray, Water Fog, Dry Chemical, CO2.

Fire Fighting Instructions
Evacuate personnel to a safe area. Keep personnel removed and upwind of fire. Wear self-contained breathing apparatus. Wear full protective equipment. Use water spray. Cool tank/container with water spray. Isolate area. Fight fire from maximum distance, use extreme caution as heat may decompose material and rupture containers.

If area is heavily exposed to fire and if conditions permit, let fire burn itself out since water may increase the area contaminated.

ACCIDENTAL RELEASE MEASURES

Safeguards (Personnel)
NOTE: Review FIRE FIGHTING MEASURES and HANDLING (PERSONNEL) sections before proceeding with clean-up. Use appropriate PERSONAL PROTECTIVE EQUIPMENT during clean-up.

Initial Containment
Remove source of heat, sparks, flame, impact, friction or electricity.

Accidental Release Measures

Contain spill. Shovel or sweep up powder. Use sawdust, sand, oil dry or other absorbent material as an aid to removing remaining traces of spilled material. Do not allow the material to enter sewers, waterways or low areas.

If product enters crevices and can not be removed, treat with a sodium hydroxide solution and allow to stand 4 hours.

NOTE: Sodium hydroxide is caustic and causes burns. Do not get in eyes, on skin, or on clothing. In case of contact, flush eyes or skin with plenty of water and call a physician. When handling, wear goggles in addition to boots and gloves.

HANDLING AND STORAGE

Handling (Personnel)
Do not breathe vapor or mist. Do not breathe dust. Do not get in eyes, on skin, or on clothing. Wash thoroughly after handling. Wash clothing after use. Do not store or consume food, drink or tobacco in areas where they may become contaminated with this material.

USERS SHOULD: Wash hands before eating, drinking, chewing

(Continued)

gum, using tobacco or using the toilet. Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing. Remove personal protective equipment immediately after handling this product. Wash the outside of gloves before removing.

Handling (Physical Aspects)
Avoid dust generation. Keep away from heat, sparks and flames.

Storage
Handle this package carefully to prevent breakage of inner bag when stored at low temperatures. Allow to warm above 50 deg F for normal handling. Store product in original container only. Do not contaminate water, other pesticides, fertilizer, food or feed in storage. Not for use or storage in or around the home.

EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls
Use only with adequate ventilation. Keep container tightly closed.

Personal Protective Equipment
Applicators and other handlers must wear:
- Long-sleeved shirt and long pants
- Waterproof gloves
- Shoes plus socks
- Protective eyewear

For exposures in enclosed areas, a respirator with either an organic vapor-removing cartridge with a prefilter approved for pesticides (MSHA/NIOSH approval number prefix TC-23C), or a canister approved for pesticides (MSHA/NIOSH approval number prefix TC-14G).

For exposures outdoors, a dust/mist filtering respirator (MSHA/NIOSH approval number prefix TC-21C).

Discard clothing or other absorbent materials that have been drenched or heavily contaminated with this product's concentrate. Do not reuse them. Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

PPE required for early reentry to treated areas that is permitted under the Workers Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water, is:
- Coveralls
- Waterproof gloves
- Shoes plus socks
- Protective eyewear

(Continued)

EXPOSURE CONTROLS/PERSONAL PROTECTION(Continued)

 # Exposure Guidelines

Applicable Exposure Limits

METHOMYL

PEL	(OSHA)	None Established
TLV	(ACGIH)	2.5 mg/m3, 8 Hr. TWA Notice of Intended Changes (1995-1996) A4
AEL *	(DuPont)	None Established

* AEL is DuPont's Acceptable Exposure Limit. Where governmentally imposed occupational exposure limits which are lower than the AEL are in effect, such limits shall take precedence.

PHYSICAL AND CHEMICAL PROPERTIES

Physical Data

Solubility in Water	5.8 WT% @ 25 C (77 F)
Odor	Slightly sulfurous
Form	Solid
Color	White
Specific Gravity	1.2946 @ 25C (77F)
Bulk Density (Loose)	30-38 lb/cu ft
Bulk Density (Packed)	37-43 lb/cu ft

STABILITY AND REACTIVITY

Chemical Stability

Stable at normal temperatures and storage conditions.

Incompatibility with Other Materials

Incompatible with strong bases.

Polymerization

Polymerization will not occur.

Other Hazards

Decomposition : Thermal decomposition and combustion will produce hazardous gases. These may include sulfur oxides, methyl isocyanate and hydrogen cyanide.

ECOLOGICAL INFORMATION

Ecotoxicological Information

Aquatic Toxicity

Methomyl is extremely toxic:
96 hour LC50, bluegill sunfish: 0.72 ppm
96 hour LC50, rainbow trout: 3.4 ppm

(Continued)

DISPOSAL CONSIDERATIONS

Waste Disposal

Treatment, storage, transportation and disposal must be in accordance with applicable Federal, State/Provincial, and Local regulations. Do not flush to surface water or sanitary sewer system.

DISPOSAL: Do not contaminate water, food or feed by storage. Pesticide wastes are acutely hazardous. Improper disposal of excess pesticide, spray mixture, or rinsate is a violation of Federal Law. If these wastes cannot be disposed of by use according to label instructions, contact your State Pesticide or Environmental Control Agency, or the Hazardous Waste representative at the nearest EPA Regional Office for guidance.

CONTAINER DISPOSAL: Completely empty bag into application equipment. Then dispose of empty package in a sanitary landfill or by incineration, or, if allowed by State and Local authorities, by burning. If burned, stay out of smoke.

TRANSPORTATION INFORMATION

Shipping Information

DOT/IMO

Proper Shipping Name	CARBAMATE PESTICIDE, SOLID, TOXIC (methomyl)
Hazard Class	6.1
UN No.	UN 2757
Special Information	Marine Pollutant (water or bulk)
Packing Group	II

REGULATORY INFORMATION

U.S. Federal Regulations

TITLE III HAZARD CLASSIFICATIONS SECTIONS 311, 312

Acute	: Yes
Chronic	: No
Fire	: No
Reactivity	: No
Pressure	: No

ADDITIONAL REGULATORY INFORMATION

Section 302 Extremely Hazardous Substance:
Methomyl - Threshold Planning Quantity (TPQ)
(500/10,000 lbs)

SARA/CERCLA Reportable Quantity:
Methomyl (100 lbs)

(Continued)

REGULATORY INFORMATION(Continued)

REGULATORY CONTROLS:
This product is registered under EPA/FIFRA regulations. It is a violation of Federal Laws to use this product in any manner inconsistant with its labeling. Read and follow all label directions. This product is excluded from listing requirements under EPA/TSCA.

EPA Reg. No. 352-342

OTHER INFORMATION

NFPA, NPCA-HMIS

NFPA Rating	
Health	2
Flammability	1
Reactivity	1

NPCA-HMIS Rating	
Health	3
Flammability	1
Reactivity	1

Personal Protection rating to be supplied by user depending on use conditions.

Additional Information
RESTRICTED USE PESTICIDE

Due to High Acute Toxicity to Humans

For retail sale and use only by Certified Applicators or persons under their direct supervision and only for those uses covered by the Certified Applicator's certification. Direct supervision for this product requires the certified applicator to review federal and supplemental label instructions with all personnel prior to application, mixing, loading, or repair or cleaning of application equipment.

The data in this Material Safety Data Sheet relates only to the specific material designated herein and does not relate to use in combination with any other material or in any process.

Responsibility for MSDS	DuPont
Address	Agricultural Products Wilmington DE 19898
Telephone	800-441-7515

# Indicates updated section.

End of MSDS

EMERGENCY TELEPHONE NUMBERS:
(610) 337-3638 (PRIMARY)
(800) 424-9300 (CHEMTREC)

ADDRESS:
ELF ATOCHEM NORTH AMERICA, INC.
AGCHEM DIVISION
2000 MARKET ST., 21st FLOOR
PHILADELPHIA, PA 19103-3222

FORM 4667
REV. 8/93

DATA SHEET

PRODUCT IDENTIFICATION

PRODUCT NAME
TOPSIN M WSB
FUNGICIDE

EPA REG. NO.
4581-377

ELF ATOCHEM NORTH AMERICA, INC. CODE NUMBER
[illegible]

CHEMICAL NAME AND MOLECULAR FORMULA
DIMETHYL [(1,2-PHENYLENE)BIS (IMINOCARBONOTHIOYL)] BIS [CARBAMATE]
$C_{12}H_{14}N_4O_4S_2$

SYNONYMS
THIOPHANATE-METHYL

CAS NUMBER OF ACTIVE INGREDIENT
23564-05-8

CHEMICAL FAMILY
THIOALLOPHANATE

HAZARDOUS INGREDIENTS

MATERIALS OR COMPONENTS	% W/W
Thiophanate-Methyl	70.0

To the best of Elf Atochem North America's knowledge, contains no substances known to be carcinogens.

SARA TITLE III

Hazard Classification (40 CFR 370):
Immediate Health: YES
Delayed Health: NO
Fire: NO
Sudden Pressure: NO
Reactivity: NO

Section 313 (40 CFR 372): This product contains the following chemicals subject to SARA Section 313 reporting requirements: Thiophanate-methyl.

◆ NFPA RATINGS

Flammability: 0
Reactivity: 0
Health: 0

NA = NOT APPLICABLE
NE = NOT ESTABLISHED
◆ = SECTION REVISED

SHIPPING INFORMATION

PROPER SHIPPING DESCRIPTION
AGRICULTURAL FUNGICIDE, SOLID, NOS.
NOT REGULATED BY DOT

PLACARD
NOT REQUIRED

PHYSICAL PROPERTIES

PHYSICAL STATE

BOILING POINT/RANGE
NA

MELTING POINT
NA

FREEZING POINT
NA

MOLECULAR WEIGHT (CALCULATED)
NA

DENSITY
0.278 g/cc = 17.4 lbs/ft³ (non-compacted)

SPECIFIC GRAVITY (H_2O = 1)
1.5313 @ 20/20°C

VAPOR PRESSURE (mm Hg)
7.12 X 10⁻⁸ mm Hg @ 25°C

VAPOR DENSITY (AIR = 1)
NE

SOLUBILITY IN H_2O
INSOLUBLE

% VOLATILES BY VOLUME
NA

EVAPORATION RATE
NA

APPEARANCE AND ODOR
FINE, LIGHT TAN POWDER WITH FAINT SULFUR ODOR

FIRE AND EXPLOSION DATA

FLASH POINT (TEST METHOD)
NA

FLAMMABLE LIMITS
NA

AUTOIGNITION TEMPERATURE/ FIRE POINT
NA

EXTINGUISHING MEDIA
- [x] WATER SPRAY
- [x] WATER FOG
- [x] WATER STREAM
- [x] CO_2
- [x] DRY CHEMICAL
- [ ] ALCOHOL FOAM
- [x] FOAM
- [x] EARTH OR SAND

SPECIAL FIRE FIGHTING PROCEDURES
- [ ] DO NOT ENTER BUILDING
- [ ] ALLOW FIRE TO BURN
- [ ] WATER MAY CAUSE FROTHING
- [ ] DO NOT USE WATER
- [x] OTHER: NA

UNUSUAL FIRE AND EXPLOSION HAZARDS
- [ ] DUST EXPLOSION HAZARD
- [ ] SENSITIVE TO SHOCK
- [ ] CONTAMINATION
- [ ] TEMPERATURE
- [x] OTHER: NA

REACTIVITY DATA

STABILITY
- [x] STABLE
- [ ] UNSTABLE

CONDITIONS CONTRIBUTING TO INSTABILITY
NA

INCOMPATIBILITY — AVOID CONTACT WITH
- [ ] STRONG ACIDS
- [ ] STRONG ALKALIS
- [x] STRONG OXIDIZERS

REACTIVITY DATA, CONTINUED

HAZARDOUS DECOMPOSITION PRODUCTS, THERMAL AND OTHER:
NA

CONDITIONS TO AVOID
- [ ] HEAT
- [ ] OPEN FLAMES
- [ ] SPARKS
- [ ] IGNITION SOURCES
- [x] OTHER: NA

SPILL OR LEAK

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED
- [x] FLUSH WITH WATER
- [ ] ABSORB WITH SAND OR INERT MATERIAL
- [ ] NEUTRALIZE
- [x] SWEEP OR SCOOP UP AND REMOVE
- [ ] KEEP UPWIND, EVACUATE ENCLOSED SPACES
- [ ] PREVENT SPREAD OR SPILL
- [ ] DISPOSE OF IMMEDIATELY

WASTE DISPOSAL METHOD
Waste resulting from the use of this product may be disposed of on site or at an approved waste disposal facility.

CONTINUED ON OTHER SIDE

TOPSIN

..., USING PRODUCT, READ AND FOLLOW DIRECTIONS AND PRECAUTIONS ON PRODUCT LABEL AND BULLETIN

TOXICITY

ORAL (ACUTE)
LD_{50} (RAT) — 5,200 mg/kg

DERMAL (ACUTE)
LD_{50} (RABBIT) > 10,000 mg/kg

INHALATION (ACUTE)
LC_{50} (RAT) > 1.8 mg/L (4 HR)

CHRONIC, SKIN SENSITIZING, ETC.
TWO-YEAR FEEDING STUDIES CONDUCTED WITH THE ACTIVE INGREDIENT HAVE ESTABLISHED NO EFFECT LEVELS IN THE FOLLOWING ANIMALS:
RAT — 100 PPM
DOG — 30 MG/KG/DAY

HEALTH HAZARD INFORMATION

EFFECTS OF EXPOSURE TO CONCENTRATE

PERMISSIBLE EXPOSURE LIMIT (TLV/TWA OR OSHA PEL)
ACGIH TLV NE
OSHA TWA NE

IRRITATION
NA

CORROSIVITY
NA

SENSITIZATION
A SENSITIZER

HEALTH HAZARD INFORMATION, CONTINUED

INHALATION EFFECTS
NA

LUNG EFFECTS
IRRITATION, COUGHING UPON HEAVY OVEREXPOSURE

EMERGENCY FIRST AID

◆ INGESTION
- [X] GET MEDICAL ATTENTION
- [X] INDUCE VOMITING
- [ ] DO NOT INDUCE VOMITING
- [X] GIVE TWO GLASSES OF WATER

◆ DERMAL
- [X] GET MEDICAL ATTENTION IF IRRITATION PERSISTS
- [X] FLUSH WITH SOAP AND WATER
- [X] CONTAMINATED CLOTHING — REMOVE AND LAUNDER
- [ ] CONTAMINATED SHOES — DESTROY

◆ EYE CONTACT
- [X] GET MEDICAL ATTENTION IF IRRITATION PERSISTS
- [X] FLUSH WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES

INHALATION
- [ ] GET MEDICAL ATTENTION
- [X] REMOVE TO FRESH AIR
- [ ] IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION
- [ ] GIVE OXYGEN

SPECIAL PROTECTION INFORMATION

VENTILATION RECOMMENDED —
ALWAYS MAINTAIN EXPOSURE BELOW PERMISSIBLE EXPOSURE LIMITS
- [ ] CONSULT AN INDUSTRIAL HYGIENIST OR ENVIRONMENTAL HEALTH SPECIALIST
- [X] LOCAL EXHAUST
- [X] USE WITH ADEQUATE VENTILATION
- [ ] CHECK FOR AIR CONTAMINANT AND OXYGEN DEFICIENCY

EYE
USE NORMAL SAFETY PRECAUTIONS

◆ HAND (GLOVE TYPE)
- [X] WEAR WATERPROOF GLOVES WHEN APPLYING OR HANDLING

RESPIRATION TYPE —
NOT REQUIRED — USE NORMAL SAFETY PRECAUTIONS

OTHER PROTECTIVE EQUIPMENT
Applicators and other handlers must wear:
- long-sleeved shirt,
- long pants, and
- shoes plus socks

SPECIAL PRECAUTIONS

PRECAUTIONARY LABELING
- [X] WASH THOROUGHLY AFTER HANDLING
- [X] DO NOT GET IN EYES, ON SKIN OR CLOTHING
- [X] DO NOT BREATHE DUST, VAPOR, MIST, GAS
- [X] KEEP CONTAINER CLOSED
- [ ] KEEP AWAY FROM HEAT SPARKS AND OPEN FLAMES
- [ ] STORE IN TIGHTLY CLOSED CONTAINERS
- [ ] DO NOT STORE NEAR COMBUSTIBLES
- [ ] KEEP FROM CONTACT WITH CLOTHING AND OTHER COMBUSTIBLE MATERIALS
- [X] EMPTY CONTAINER MAY CONTAIN HAZARDOUS RESIDUES
- [ ] USE EXPLOSION-PROOF EQUIPMENT

OTHER HANDLING AND STORAGE CONDITIONS
Store in the original container in a dry area. Do not store in a manner where cross-contamination with other pesticides, fertilizer, feed or seed could result.

[redacted]

DATE: 6/93

ADDRESS
ELF ATOCHEM NORTH AMERICA, INC.
AGCHEM DIVISION
2000 MARKET ST., 21st FLOOR
PHILADELPHIA, PA 19103-3222

PHONE:
(215) 419-7447

PLEASE NOTE

[redacted] Elf Atochem North America, Inc. believes that the information and recommendations contained herein (including data and statements) are accurate as of the date hereof. NO WARRANTY OF FITNESS FOR ANY PARTICULAR PURPOSE, WARRANTY OF MERCHANTABILITY, OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED, IS MADE CONCERNING THE INFORMATION PROVIDED HEREIN. The information provided herein relates only to the specific product designated and may not be valid where such product is used in combination with any other materials or in any process. Further, since the conditions and methods of use of the product and of the information referred to herein are beyond the control of Elf Atochem, Elf Atochem expressly disclaims any and all liability as to any results obtained or arising from any use of the product or reliance on such information.

HSDB

Topic: FOSETYL-AL

SUBSTANCE IDENTIFICATION

Name of Substance:

1. FOSETYL-AL

CAS Registry Number:

1. 39148-24-8

Related HSDB Records:

1. 507 [ALUMINUM

Synonyms:

1. Phosphonic acid monoethyl ester aluminum salt **PEER REVIEWED** [Budavari, S. (ed.). The Merck Index - Encyclopedia of Chemicals, Drugs and Biologicals. Rahway, NJ: Merck and Co., Inc., 1989. 665
2. Aluminum tris(ethyl phosphite) **PEER REVIEWED** [Budavari, S. (ed.). The Merck Index - Encyclopedia of Chemicals, Drugs and Biologicals. Rahway, NJ: Merck and Co., Inc., 1989. 665
3. Aluminum tris(O-ethylphosphonate) **PEER REVIEWED** [Budavari, S. (ed.). The Merck Index - Encyclopedia of Chemicals, Drugs and Biologicals. Rahway, NJ: Merck and Co., Inc., 1989. 665
4. Phosethyl Al **PEER REVIEWED** [Budavari, S. (ed.). The Merck Index - Encyclopedia of Chemicals, Drugs and Biologicals. Rahway, NJ: Merck and Co., Inc., 1989. 665
5. LS 74-783 **PEER REVIEWED** [Budavari, S. (ed.). The Merck Index - Encyclopedia of Chemicals, Drugs and Biologicals. Rahway, NJ: Merck and Co., Inc., 1989. 665
6. Aliette **PEER REVIEWED** [Budavari, S. (ed.). The Merck Index - Encyclopedia of Chemicals, Drugs and Biologicals. Rahway, NJ: Merck and Co., Inc., 1989. 665
7. Fosetyl-aluminium **PEER REVIEWED** [Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987.,p. A013/AUG 87
8. Aluminium tris(ethyl phosphonate) **PEER REVIEWED** [Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987.,p. A013/AUG 87
9. Aluminium phosethyl **PEER REVIEWED** [Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987.,p. A013/AUG 87
10. LS 74783 **PEER REVIEWED** [Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987.,p. A013/AUG 87
11. LS 74 783 **PEER REVIEWED** [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987. 438

12. Mikal **PEER REVIEWED** [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987. 438
13. Aliette Extra **PEER REVIEWED** [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987. 438
14. Hy-Cote **PEER REVIEWED** [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987. 438
15. Hy-Tona **PEER REVIEWED** [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987. 438
16. Fosetyl Al **PEER REVIEWED** [Farm Chemicals Handbook 1993. Willoughby, OH: Meister Publishing Co., 1993.,p. C-163
17. Rhodax **PEER REVIEWED** [Farm Chemicals Handbook 1993. Willoughby, OH: Meister Publishing Co., 1993.,p. C-163
18. Valiant **PEER REVIEWED** [Farm Chemicals Handbook 1993. Willoughby, OH: Meister Publishing Co., 1993.,p. C-163
19. R6 Triplo **PEER REVIEWED** [Farm Chemicals Handbook 1993. Willoughby, OH: Meister Publishing Co., 1993.,p. C-163

Molecular Formula:

1. C6-H18-Al-O9-P3 **PEER REVIEWED** [Budavari, S. (ed.). The Merck Index - Encyclopedia of Chemicals, Drugs and Biologicals. Rahway, NJ: Merck and Co., Inc., 1989. 665

Shipping Name/Number - DOT/UN/NA/IMCO:

1. NA 2588; Insecticide, dry, nos
2. IMO 6.1; Pesticides, solid, toxic, nos

MANUFACTURE/USE INFORMATION

Formulations/Preparations:

1. Wettable powder **PEER REVIEWED** [Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987.,p. A013/AUG 87
2. Mixed formulations: (fosetyl-aluminum +) folpet; mancozeb; captan + thiabendazole; bendiocarb + captan + thiabendazole. **PEER REVIEWED** [Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987.,p. A013/AUG 87
3. 'Aliette', wettable powder (800 g fosetyl-aluminum/kg). Mixtures include: 'Aliette Extra', 'Hy-Cote', water dispersible powder for slurry treatment (fosetyl-aluminum + captan + thiabendazole); 'Hy-Tona', water dispersible powder for slurry treatment (300 g fosetyl-aluminum + 300

g bendiocarb + 100 g captan + 75 g thiabendazole/kg); 'Mikal', wettable powder (500 g fosetyl-aluminum + 250 g folpet/kg). **PEER REVIEWED** [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987. 438

4. Water dispersable granule, wettable powder, 10% liquid injectable **PEER REVIEWED** [Farm Chemicals Handbook 1993. Willoughby, OH: Meister Publishing Co., 1993.,p. C-163
5. Rhodax (44% fosetyl Al, 26% mancozeb); Valiant (50% fosetyl Al, 25% folpet, 4% cymoxanil); R6 Triplo (32.5% fosetyl Al, 26% mancozeb, 25% cymoxanil). **PEER REVIEWED** [Farm Chemicals Handbook 1993. Willoughby, OH: Meister Publishing Co., 1993.,p. C-163

Manufacturers:

1. Rhone-Poulenc Ag Co, PO Box 12014, Research Triangle Park, NC 27609, (919) 549-2000 **PEER REVIEWED** [Farm Chemicals Handbook 1993. Willoughby, OH: Meister Publishing Co., 1993.,p. C 163

Major Uses:

1. Control of diseases caused by Phycomycetes (Phytophthora, Plasmopara, Bremia species) on lettuce, hops, strawberries, pome fruit, citrus fruit, pineapples, avocados, vines, cucurbits, onions, cocoa, rubber, tobacco, and ornamental plants and shrubs. **PEER REVIEWED** [Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987.,p. A013/AUG 87
2. Bactericide, systemic fungicide. ... Preventive and curative activity against Oomycetes, Alternaria and Pennicillium on avocado, cacao, citrus, hops, ornamentals, pineapple, rubber, strawberries, fruit crops, tobacco, vegetable crops, and vines. Suppression of bacterial pathogens: fireblight (eawinia) on pome fruit, xanthomonas and on ornamentals. **PEER REVIEWED** [Farm Chemicals Handbook 1993. Willoughby, OH: Meister Publishing Co., 1993.,p. C-163

CHEMICAL & PHYSICAL PROPERTIES

Color/Form:

1. White crystals **PEER REVIEWED** [Budavari, S. (ed.). The Merck Index - Encyclopedia of Chemicals, Drugs and Biologicals. Rahway, NJ: Merck and Co., Inc., 1989. 665
2. Colorless crystals **PEER REVIEWED** [Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987.,p. A013/AUG 87
3. Colorless powder **PEER REVIEWED** [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World

Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987. 438

Odor:

1. Odorless **PEER REVIEWED** [Budavari, S. (ed.). The Merck Index - Encyclopedia of Chemicals, Drugs and Biologicals. Rahway, NJ: Merck and Co., Inc., 1989. 665

Melting Point:

1. >300 deg C **PEER REVIEWED** [Budavari, S. (ed.). The Merck Index - Encyclopedia of Chemicals, Drugs and Biologicals. Rahway, NJ: Merck and Co., Inc., 1989. 665

Molecular Weight:

1. 354.11 **PEER REVIEWED** [Budavari, S. (ed.). The Merck Index - Encyclopedia of Chemicals, Drugs and Biologicals. Rahway, NJ: Merck and Co., Inc., 1989. 665

Corrosivity:

1. Non-corrosive to metals **PEER REVIEWED** [Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987.,p. A013/AUG 87

Solubilities:

1. Solubility in water at 20 deg C: 120 g/l. Practically insol in acetonitrile, propylene glycol (<80 mg/l) **PEER REVIEWED** [Budavari, S. (ed.). The Merck Index - Encyclopedia of Chemicals, Drugs and Biologicals. Rahway, NJ: Merck and Co., Inc., 1989. 665
2. Practically insoluble (<5 mg/l) in /some/ organic solvents at 20 deg C **PEER REVIEWED** [Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987.,p. A013/AUG 87

Vapor Pressure:

1. Negligible at room temperature **PEER REVIEWED** [Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987.,p. A013/AUG 87

Other Chemical/Physical Properties:

1. Decomposes above 200 deg C. **PEER REVIEWED** [Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987.,p. A013/AUG 87

SAFETY & HANDLING

Emergency Guidelines

DOT Emergency Guidelines:

1. Health Hazards: Poisonous; may be fatal if inhaled, swallowed or absorbed through skin. Contact may cause burns to skin and eyes. Runoff from fire control or dilution water may cause pollution. /Organophosphorus pesticide, liquid, poisonous, flammable, not otherwise specified/ **PEER REVIEWED** [U.S. Department of

Transportation. Emergency Response Guidebook 1990. DOT P 5800.5. Washington, DC: U.S. Government Printing Office, 1990.,p. G-28

2. Fire or Explosion: Flammable/combustible material; may be ignited by heat, sparks or flames. Vapors may travel to a source of ignition and flash back. Container may explode in heat of fire. Vapor explosion and poison hazard indoors, outdoors or in sewers. Runoff to sewer may create fire or explosion hazard. /Organophosphorus pesticide, liquid, poisonous, flammable, not otherwise specified/ **PEER REVIEWED** [U.S. Department of Transportation. Emergency Response Guidebook 1990. DOT P 5800.5. Washington, DC: U.S. Government Printing Office, 1990.,p. G-28
3. Emergency Action: Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and chemical protective clothing which is specifically recommended by the shipper or manufacturer may be worn. It may provide little or no thermal protection. Structural firefighters' protective clothing is not effective for these materials. Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire. CALL CHEMTREC AT 1-800-424-9300 FOR EMERGENCY ASSISTANCE. /Organophosphorus pesticide, liquid, poisonous, flammable, not otherwise specified/ **PEER REVIEWED** [U.S. Department of Transportation. Emergency Response Guidebook 1990. DOT P 5800.5. Washington, DC: U.S. Government Printing Office, 1990.,p. G-28
4. Fire: Small Fires: Dry chemical, CO2, water spray or alcohol-resistant foam. Large Fires: Water spray, fog or alcohol-resistant foam. Move container from fire area if you can do it without risk. Dike fire-control water for later disposal; do not scatter the material. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire. /Organophosphorus pesticide, liquid, poisonous, flammable, not otherwise specified/ **PEER REVIEWED** [U.S. Department of Transportation. Emergency Response Guidebook 1990. DOT P 5800.5. Washington, DC: U.S. Government Printing Office, 1990.,p. G-28
5. Spill or Leak: Shut off ignition sources; no flares, smoking or flames in hazardarea. Fully-encapsulating, vapor-protective clothing should be worn for spills and leaks with no fire. Do not touch or walk through spilled material; stop leak if you can do it without risk. Water spray may reduce vapor; but it may not prevent ignition in

closed spaces. Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal. Large Spills: Dike far ahead of liquid spill for later disposal. /Organophosphorus pesticide, liquid, poisonous, flammable, not otherwise specified/ **PEER REVIEWED** [U.S. Department of Transportation. Emergency Response Guidebook 1990. DOT P 5800.5. Washington, DC: U.S. Government Printing Office, 1990.,p. G-28

6. First Aid: Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation. /Organophosphorus pesticide, liquid, poisonous, flammable, not otherwise specified/ **PEER REVIEWED** [U.S. Department of Transportation. Emergency Response Guidebook 1990. DOT P 5800.5. Washington, DC: U.S. Government Printing Office, 1990.,p. G-28
7. Health Hazards: Poisonous; may be fatal if inhaled, swallowed or absorbed through skin. Contact may cause burns to skin and eyes. Runoff from fire control or dilution water may give off poisonous gases and cause water pollution. Fire may produce irritating or poisonous gases. /Organophosphorus pesticide, liquid or solid, poisonous, not otherwise specified/ **PEER REVIEWED** [U.S. Department of Transportation. Emergency Response Guidebook 1990. DOT P 5800.5. Washington, DC: U.S. Government Printing Office, 1990.,p. G-55
8. Fire or Explosion: Some of these materials may burn, but none of them ignites readily. Container may explode violently in heat of fire. /Organophosphorus pesticide, liquid or solid, poisonous, not otherwise specified/ **PEER REVIEWED** [U.S. Department of Transportation. Emergency Response Guidebook 1990. DOT P 5800.5. Washington, DC: U.S. Government Printing Office, 1990.,p. G-55
9. Emergency Action: Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind, out of low areas, and ventilate closed spaces before entering. Positive pressure self-contained breathing apparatus (SCBA) and chemical protective clothing which is specifically recommended by the shipper or manufacturer may be worn. It may provide little or no thermal protection. Structural firefighters' protective clothing is not effective for these materials. Remove and isolate contaminated clothing

at the site. CALL CHEMTREC AT 1-800-424-9300 AS SOON AS POSSIBLE, especially if there is no local hazardous materials team available. /Organophosphorus pesticide, liquid or solid, poisonous, not otherwise specified/ **PEER REVIEWED** [U.S. Department of Transportation. Emergency Response Guidebook 1990. DOT P 5800.5. Washington, DC: U.S. Government Printing Office, 1990.,p. G-55

10. Fire: Small Fires: Dry chemical, CO2, water spray or regular foam. Large Fires: Water spray, fog or regular foam. Move container from fire area if you can do it without risk. Fight fire from maximum distance. Stay away from ends of tanks. Dike fire-control water for later disposal; do not scatter the material. /Organophosphorus pesticide, liquid or solid, poisonous, not otherwise specified/ **PEER REVIEWED** [U.S. Department of Transportation. Emergency Response Guidebook 1990. DOT P 5800.5. Washington, DC: U.S. Government Printing Office, 1990.,p. G-55
11. Spill or Leak: Do not touch or walk through spilled material; stop leak if you can do it without risk. Fully-encapsulating, vapor-protective clothing should be worn for spills and leaks with no fire. Use water spray to reduce vapors. Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal. Small Dry Spills: With clean shovel place material into clean, dry container and cover loosely; move containers from spill area. Large Spills: Dike far ahead of liquid spill for later disposal. /Organophosphorus pesticide, liquid or solid, poisonous, not otherwise specified/ **PEER REVIEWED** [U.S. Department of Transportation. Emergency Response Guidebook 1990. DOT P 5800.5. Washington, DC: U.S. Government Printing Office, 1990.,p. G-55
12. First Aid: Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation. /Organophosphorus pesticide,liquid or solid, poisonous, not otherwise specified/ **PEER REVIEWED** [U.S. Department of Transportation. Emergency Response Guidebook 1990. DOT P 5800.5. Washington, DC: U.S. Government Printing Office, 1990.,p. G-55

Flammable Properties

Fire Potential:

1. Nonflammable **PEER REVIEWED** [Farm Chemicals Handbook 1993. Willoughby, OH: Meister Publishing Co., 1993.,p. C-163

Hazardous Reactions

Reactivities and Incompatibilities:

1. Incompatible with foliar fertilizers. **PEER REVIEWED** [Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987.,p. A013/AUG 87

Other Safety & Handling

Stability/Shelf Life:

1. Decomposed by strong acids and alkalis. Oxidized by strong oxidizing agents. Decomposes above 200 deg C. **PEER REVIEWED** [Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987.,p. A013/AUG 87
2. Stable under normal storage conditions. **PEER REVIEWED** [Farm Chemicals Handbook 1993. Willoughby, OH: Meister Publishing Co., 1993.,p. C-163

Shipment Methods and Regulations:

1. No person may /transport/ offer or accept a hazardous material for transportation in commerce unless that material is properly classed, described, packaged, marked, labeled, and in condition for shipment as required or authorized by ... /the hazardous materials regulations (49 CFR 171-177)./ **PEER REVIEWED** [49 CFR 171.2 (10/1/90)
2. Domestic Transportation: Chemical: Insecticide, dry, nos. Primary Hazard Class: Poison B. A poison B is a substance that is known to be toxic to humans and poses a severe health hazard if released during transportation. NA 2588. Label(s) required: Poison. Acceptable Modes of Transportation: Air, rail, road, and water. /Insecticide, dry, nos/ **PEER REVIEWED** [49 CFR 172.101 (10/1/90)
3. Int'l Air Shipments: Chemical: Pesticides, solid, toxic, nos. IMO Class: 6.1. UN2588. Primary hazard label: Poison, keep away from food (packaging group I, II, III). Additional packaging instructions listed in the table must also be followed. /Pesticides, solid, toxic, nos/ **PEER REVIEWED** [IATA. Dangerous Goods Regulations. 34th ed. Montreal, Canada and Geneva, Switzerland: International Air Transport Association, Quality in Air Transport, January 1993. 172
4. International Water Shipments: Chemical: Pesticides, solid, toxic, nos. IMO Class: 6.1, poisons. UN 2588. Packaging Group: I, II, III. Label(s) required: Poison; or harmful, stow away from foodstuffs. /Pesticides, solid, toxic, nos/ **PEER REVIEWED** [IMDG; International Maritime Dangerous Goods Code; International Maritime

Topic: POSETYL-AL

Organization p.6195 (1988)

TOXICITY/BIOMEDICAL EFFECTS

Summary

Toxic Hazard Rating:

1. CLASSIFICATION: C; possible human carcinogen. BASIS FOR CLASSIFICATION: Increased incidence of urinary bladder tumors (adenomas/carcinomas) in male rats. No increase in tumor incidence occurred in female rats or in mice of either sex. HUMAN CARCINOGENICITY DATA: None. ANIMAL CARCINOGENICITY DATA: Limited. **PEER REVIEWED** [U.S. Environmental Protection Agency's Integrated Risk Information System (IRIS) on Fosetyl-al (39148-24-8) from the National Library of Medicine's TOXNET System, November 10, 1993

Toxicity Excerpts

Non-Human Toxicity Excerpts:

1. Non-phytotoxic when used as directed. **PEER REVIEWED** [Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987.,p. A013/AUG 87
2. Low toxicity to birds. ... Not toxic to bees. **PEER REVIEWED** [Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987.,p. A013/AUG 87
3. Aliette, a fungicide compound, was evaluated for carcinogenic potential by the Health Effects Division of the Office of Pesticide Programs using a consensus peer review process and EPA's guidelines for risk assessment. Aliette was categorized as a group C (possible human) carcinogen based upon evidence of an increased incidence of combined benign and malignant urinary bladder tumors in a single study involving male Charles River CD rats. The bladder tumors occurred only at the unusually high top dose level of aliette that was tested (40,000/30,000 ppm). The compound was not carcinogenic in female Charles River-CD rats in the same study, or in CD-1 mice of either sex in a second study. Monosodium phosphite, the main urinary metabolite of aliette, was also not carcinogenic in male or female Charles River-CD rats. Aliette was not demonstrated to be genotoxic. No structural analogues of aliette were identified. The mechanism of action for the production of bladder tumors was not identified; however it did not appear to involve a genotoxic effect, a carcinogenic effect of metabolites, or the formation of renal stones. The data were not found to be sufficient to quantify human cancer risk from aliette. **PEER REVIEWED** [Quest JA et al; Regul Toxicol Pharmacol 14 (1): 3-11 (1991)

Toxicity Values

Non-Human Toxicity Values:

1. LD50 Rat oral 5800 mg/kg **PEER REVIEWED** [Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987.,p. A013/AUG 87
2. LD50 Mouse oral 3700 mg/kg **PEER REVIEWED** [Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987.,p. A013/AUG 87
3. LD50 Rat percutaneous >3200 mg/kg **PEER REVIEWED** [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987. 438

Ecotoxicity Values:

1. LC50 Rainbow trout 428 mg/l/96 hr /Conditions of bioassay not specified/ **PEER REVIEWED** [Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987.,p. A013/AUG 87

Pharmacokinetics

Absorption, Distribution and Excretion:

1. Rapidly absorbed, predominantly through the leaves but also through the roots, with translocation both acropetally and basipetally. **PEER REVIEWED** [Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987.,p. A013/AUG 87

Mechanism of Action:

1. Acts by inhibiting germination of spores or by blocking development of mycelium. **PEER REVIEWED** [Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987.,p. A013/AUG 87
2. NC 2326, a cultivar of tobacco resistant to race 0 of the black shank pathogen Phytophthora nicotianae var. nicotianae, responds to stem inoculation by rapidly accumulating sesquiterpenoid phytoalexins and activating phenylalanine ammonia lyase activity at the infection front. In cv. Hicks, a near-isogenic susceptible cultivar, both responses are slower. Pretreatment of leaf discs with propylene oxide, which kills the cells, mevinolin, a specific inhibitor of sesquiterpenoid biosynthesis, or the non-specific amino transferase inhibitor, aminooxyacetic acid, inhibit post-infection phytoalexin accumulation in both cultivars, and induce susceptibility in cv. NC 2326. Aminohydrazinophenylpropionic acid, a specific inhibitor of phenylalanine ammonia lyase activity and aminoethoxyvinylglycine, an inhibitor of ethylene biosynthesis, do not affect the susceptibility of either

cultivar. Plants of the cv. Hicks are protected from infection by the systemic phosphonate plant protectant, fosetyl-Al. Sesquiterpenoid phytoalexins, lignin and ethylene accumulate, and phenylalanine ammonia lyase activity increases more rapidly in fosetyl-Al treated Hicks stems than in untreated stems. Propylene oxide, mevinolin and aminooxyacetic acid inhibit sesquiterpenoid phytoalexin accumulation and the effectiveness of fosetyl-Al in cv. Hicks. Fosetyl-Al does not enhance sesquiterpenoid phytoalexin biosynthesis in cv. NC 2326, and only marginally reduces pathogen growth in the initial stage of infection, before resistance is expressed. Mevinolin and aminooxyacetic acid do not induce total susceptibility in fosetyl-Al treated NC 2326, indicating that factors other than sesquiterpenoid phytoalexins are also involved in the mode of action of fosetyl-Al in this cultivar. **PEER REVIEWED** [Nemestothy GS, Guest DI; Physiol Mol Plant Pathol 37 (3): 207-20 (1990)

EXPOSURE STANDARDS & REGULATIONS

Other Standards and Regulations

-FIFRA Requirements:

1. In 1988, Congress amended FIFRA to strengthen and accelerate EPA's reregistration program. The nine-year reregistration scheme mandated by "FIFRA 88" applies to each registered pesticide product containing an active ingredient initially registered before November 1, 1984. List A consists of the 194 chemical cases (or 350 individual active ingredients) for which EPA had issued Registration Standards prior to the effective date of FIFRA '88. List: A; Case: Aliette; Case No.: 0646; Pesticide type: Fungicide; Registration Standard Date: 02/01/88; Case Status: RED Approved 01/91 ; OPP has reached a decision that some or all uses of the pesticide are eligible for reregistration, and issued a Reregistration Eligibility Document (RED). Some Products Reregistered: After the Reregistration Eligibility Document (RED) was issued, the registrant sent OPP the necessary product-specific data and revised labeling, and some or all products containing the pesticide were reregistered. ; Active Ingredient (AI): Fosetyl-Al; AI Status: OPP has completed a Reregistration Eligibility Document (RED) for the active ingredient/case. **PEER REVIEWED** [USEPA/OPP; Status of Pesticides in Reregistration and Special Review p.61 (Mar, 1992) EPA 700-R-92-004

MONITORING AND ANALYSIS METHODS

Analytic Laboratory Methods:

1. Analysis of products is by iodometric titration and analysis of residues is by GLC with phosphorus-specific

detection. **PEER REVIEWED** [Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987.,p. A013/Aug 87

RTECS(R)

Topic: Allophanic acid, 4,4'-o-phenylenebis(3-thio-, diethyl ester

1.0 SUBSTANCE IDENTIFICATION

RTECS NUMBER: BA3650000

CHEMICAL NAME: Allophanic acid, 4,4'-o-phenylenebis(3-thio-, diethyl ester

CAS NUMBER: 23564-06-9
39300-54-4

MOLECULAR FORMULA: C14-H18-N4-O4-S2

MOLECULAR WEIGHT: 370.48

WISWESSER NOTATION: 2OVMYUS&MR BMYUS&MVO2

SUBSTANCE INVESTIGATED AS: Agricultural Chemical, Mutagen, Reproductive Effector

LAST REVISION DATE: 9612

2.0 SYNONYM(S) / TRADE NAME(S)

1. BAS 3220
2. 1,2-Bis(3-ethoxycarbonyl-2-thioureido) benzene
3. Carbamic acid, (1,2-phenylenebis(iminocarbonothioyl))bis-, diethyl ester (9CI)
4. Cercobin
5. Cercobin WP 50%
6. Cerobin
7. Chipco Spot Kleen
8. Cleary 3336
9. Diethyl 4,4'-o-phenylenebis(3-thioallophanate)
10. Enovit
11. Ethyl thiophanate

RTECS(R)

Topic: 1H-Imidazole, 1-(1-((4-chloro-2- (trifluoromethyl)phenyl) imino)-2-propoxyethyl)- PROCURE

1.0 SUBSTANCE IDENTIFICATION
RTECS NUMBER: NI4490000
CHEMICAL NAME: 1H-Imidazole, 1-(1-((4-chloro-2-(trifluoromethyl)phenyl)imino)-2-propoxyethyl)-
CAS NUMBER: 68694-11-1
MOLECULAR FORMULA: C15-H15-Cl-F3-N3-O
MOLECULAR WEIGHT: 345.78
SUBSTANCE INVESTIGATED AS: Agricultural Chemical
LAST REVISION DATE: 9204

2.0 SYNONYM(S) / TRADE NAME(S)

1. 4-Chloro-alpha,alpha,alpha-trifluoro-N-(1-imidazol-1-yl-2-propoxyethylidene)-o-toluidine
2. (E)-4-Chloro-alpha,alpha,alpha-trifluoro-N-(1-imidazol-1-yl-2-propoxyethylidene)-o-toluidine
3. 1-(1-((4-Chloro-2-(trifluoromethyl)phenyl)imino)-2-propoxyethyl)-1H-imidazole
4. NF-114
5. Procure
6. Terraguard
7. Triflumizol

HSDB

Topic: AZINPHOSMETHYL

SUBSTANCE IDENTIFICATION

Name of Substance:

1. AZINPHOSMETHYL

CAS Registry Number:

1. 86-50-0

Related HSDB Records:

1. (Analog) 411 [ETHYL GUTHION

Synonyms:

1. 1,2,3-BENZOTRIAZIN-4(3H)-ONE, 3-(MERCAPTOMETHYL)-, O,O-DIMETHYL PHOSPHORODITHIOATE **PEER REVIEWED** [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry ofToxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLARS file.,p. 86/8606
2. 3-(MERCAPTOMETHYL)-1,2,3-BENZOTRIAZIN-4(3H)-ONE O,O-DIMETHYL PHOSPHORODITHIOATE S-ESTER **PEER REVIEWED** [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry ofToxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLARS file.,p. 86/8606
3. BENZOTRIAZINE DERIVATIVE OF A METHYL DITHIOPHOSPHATE **PEER REVIEWED**
4. BENZOTRIAZINEDITHIOPHOSPHORIC ACID DIMETHOXY ESTER **PEER REVIEWED**
5. DIMETHYLDITHIOPHOSPHORIC ACID N-METHYLBENZAZIMIDE ESTER **PEER REVIEWED**
6. ENT 23,233 **PEER REVIEWED**
7. N-METHYLBENZAZIMIDE, DIMETHYLDITHIOPHOSPHORIC ACID ESTER **PEER REVIEWED**
8. NCI-C00066 **PEER REVIEWED**
9. O,O-DIMETHYL S-(3,4-DIHYDRO-4-KETO-1,2,3-BENZOTRIAZINYL-3-METHYL) DITHIOPHOSPHATE **PEER REVIEWED** [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry ofToxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLARS file.,p. 86/8606
10. O,O-DIMETHYL S-(4-OXO-1,2,3-BENZOTRIAZINO(3)-METHYL)THIOTHIONOPHOSPHATE **PEER REVIEWED** [U.S. Department of Health and Human Services, Public Health Service, Center for Disease

Control, National Institute for Occupational Safety Health. Registry ofToxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLARS file.,p. 86/8606

11. O,O-DIMETHYL S-(4-OXO-3H-1,2, 3-BENZOTRIAZINE-3-METHYL)PHOSPHORODITHIOATE **PEER REVIEWED** [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry ofToxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLARS file.,p. 86/8606
12. O,O-DIMETHYL S-(4-OXOBENZOTRIAZINO-3-METHYL)PHOSPHORODITHIOATE **PEER REVIEWED**
13. O,O-DIMETHYL S-4-OXO-1,2,3-BENZOTRIAZIN-3(4H)-YLMETHYL PHOSPHORODITHIOATE **PEER REVIEWED** [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry ofToxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLARS file.,p. 86/8606
14. O,O-DIMETHYL-S-((4-OXO-3H-1,2, 3-BENZOTRIAZIN-3-YL)-METHYL)-DITHIOFOSFAAT (DUTCH) **PEER REVIEWED**
15. O,O-DIMETHYL-S-((4-OXO-3H-1,2, 3-BENZOTRIAZIN-3-YL)-METHYL)-DITHIOPHOSPHAT (GERMAN) **PEER REVIEWED**
16. O,O-DIMETHYL-S-(1,2,3-BENZOTRIAZINYL-4-KETO)METHYL PHOSPHORODITHIOATE **PEER REVIEWED** [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry ofToxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLARS file.,p. 86/8606
17. O,O-DIMETHYL-S-(BENZAZIMINOMETHYL) DITHIOPHOSPHATE **PEER REVIEWED**
18. O,O-DIMETIL-S-((4-OXO-3H-1,2, 3-BENZOTRIAZIN-3-IL)-METIL)-DITIOFOSFATO (ITALIAN) **PEER REVIEWED**
19. PHOSPHORODITHIOIC ACID, O,O-DIMETHYL ESTER, S-ESTER WITH 3-(MERCAPTOMETHYL)-1,2,3-BENZOTRIAZIN-4(3H)-ONE **PEER REVIEWED**
20. PHOSPHORODITHIOIC ACID, O,O-DIMETHYL S-((4-OXO-1,2,3-BENZOTRIAZIN-3(4H)-YL)METHYL) ESTER **PEER

REVIEWED**

21. S-(3,4-DIHYDRO-4-OXO-1,2,3-BENZOTRIAZIN-3-YLMETHYL) O,O-DIMETHYL PHOSPHORODITHIOATE **PEER REVIEWED** [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry ofToxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLARS file.,p. 86/8606

22. S-(3,4-DIHYDRO-4-OXO-BENZO(ALPHA)(1,2, 3)TRIAZIN-3-YLMETHYL) O,O-DIMETHYL PHOSPHORODITHIOATE **PEER REVIEWED** [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry ofToxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLARS file.,p. 86/8606
23. O,O-Dimethyl-S-(4-oxobenzotriazin-3-methyl)-dithiophosphat (German) **PEER REVIEWED**
24. 3-(Mercaptomethyl)-1,2,3-benzotriazin-4(3H)-one O,O-dimethyl phosphorodithioate S-ester **QC REVIEWED** [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry ofToxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLARS file.,p. 86/8606
25. GUTHION **QC REVIEWED** [Gosselin, R.E., R.P. Smith, H.C. Hodge. Clinical Toxicology of Commercial Products. 5th ed. Baltimore: Williams and Wilkins, 1984.,p. V-289
26. AZINFOS-METHYL (DUTCH) **PEER REVIEWED**
27. AZINOPHOS-METHYL **PEER REVIEWED**
28. AZINPHOS-METHYL **PEER REVIEWED**
29. AZINPHOS-METILE (ITALIAN) **PEER REVIEWED**
30. BAY 17147 **PEER REVIEWED**
31. BAY 9027 **PEER REVIEWED**
32. BAYER 17147 **PEER REVIEWED**
33. BAYER 9027 **PEER REVIEWED**
34. Azinphos methyl **PEER REVIEWED**
35. CARFENE **PEER REVIEWED**
36. COTNEON **PEER REVIEWED**
37. COTNION **PEER REVIEWED**
38. COTNION METHYL **PEER REVIEWED**
39. CRYSTHION 2L **PEER REVIEWED**
40. CRYSTHYON **PEER REVIEWED**
41. DBD **PEER REVIEWED** [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry ofToxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLARS

file.,p. 86/8606
42. GOTHNION **PEER REVIEWED**
43. GUSATHION **PEER REVIEWED**
44. GUSATHION 25 **PEER REVIEWED**
45. GUSATHION K **PEER REVIEWED**
46. GUSATHION M **PEER REVIEWED**
47. GUSATHION METHYL **PEER REVIEWED**
48. GUSATHION-20 **PEER REVIEWED**
49. METHYLAZINPHOS **PEER REVIEWED**
50. METHYLGUSATHION **PEER REVIEWED**
51. METILTRIAZOTION **PEER REVIEWED**
52. EPA Shaughnessy #058001 **QC REVIEWED** [Purdue University; National Pesticide Information Retrieval System (1988)

Molecular Formula:
1. C10-H12-N3-O3-P-S2 **QC REVIEWED** [Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987.,p. A026/Aug 87

Wiswessar Line Notation:
1. T66 BNNNVJ D1SPS&01&01 **PEER REVIEWED** [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry ofToxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLARS file.,p. 86/8606

RTECS Number:
1. NIOSH/TE1925000

Shipping Name/Number - DOT/UN/NA/IMCO:
1. NA 2783; Azinophos methyl mixture, liquid

STCC Number:
1. 49 215 26; Azinphos methyl or Guthion (agricultural insecticides, not elsewhere classified, liquid)
2. 49 215 27; Azinphos methyl or Guthion (agricultural insecticides, not elsewhere classified, other than liquid)
3. 49 215 28; Azinophos methyl or Guthion (insecticides, other than agricultural, not elsewhere classified)
4. 49 215 29; Azinphos methyl mixture or Guthion mixture, liquid (agricultural insecticides, not elsewhere classified, liquid)

MANUFACTURE/USE INFORMATION

Methods of Manufacturing:
1. Azinophosmethyl is produced by the reaction of N-bromoethylazimidobenzoyl with sodium dimethyldithiophosphoric acid. **QC REVIEWED** [National Research Council. Drinking Water & Health Volume 1. Washington, DC: National Academy Press, 1977. 604

Formulations/Preparations:
1. SPRAY CONCN (1.5 AND 2.0 LB/US GAL); 20; 40% WETTABLE

POWDER (BAYER); 25%, 50% WETTABLE POWDER (MOBAY); EMULSIFIABLE CONCN 20%. **PEER REVIEWED** [Spencer, E. Y. Guide to the Chemicals Used in Crop Protection. 7th ed. Publication 1093. Research Institute, Agriculture Canada, Ottawa, Canada: Information Canada, 1982. 27

2. Gustion MS, wettable powder (250 g azinphos-methyl + 75 g demeton-S-methyl sulfone) **QC REVIEWED** [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987. 41
3. Mixed formulations: (azinophos-methyl +) azinophos-ethyl **QC REVIEWED** [Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987.,p. A026/Aug 87

Manufacturers:

1. Bayer USA Inc, Hq, One Mellon Center, 500 Grant St, Pittsburgh, PA 15219-2502, (412) 394-5500; Subsidiary: Mobay Corp, Mobay Rd, Pittsburgh, PA 15250-9741, (412) 777-2000; Agricultural Chemicals Division, Hawthorn Rd, PO Box 4913, Kansas City, MO 64120, (816) 242-2000 **QC REVIEWED** [SRI. 1988 Directory of Chemical Producers - United States of America. Menlo Park, CA: SRI International, 1988. 821

Other Manufacturing Information:

1. Application rates: 0.047 to 10.35 lb active ingredient/acre **PEER REVIEWED** [Purdue University; National Pesticide Information Retrieval System (1987)
2. PREPN: LORENZ, US PATENT 2,758,115 (1956 TO BAYER). **QC REVIEWED** [The Merck Index. 10th ed. Rahway, New Jersey: Merck Co., Inc., 1983. 131
3. Types and methods of application: Foliar (by ground or aerial equipment); ultra low volume foliar application, soil application, and transplant water application. **QC REVIEWED** [Purdue University; National Pesticide Information Retrieval System (1987)

Major Uses:

1. Nonsystemic insecticide and acaricide **QC REVIEWED** [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983. 226
2. Organosphosphate insecticide, acaricide, moluscicide **QC REVIEWED** [Purdue University; National Pesticide Information Retrieval System (1988)

Consumption Patterns:

1. INSECTICIDE FOR DECIDUOUS FRUITS & NUTS, 53%; COTTON, 17%; SOYBEANS, 10%; VEGETABLES, 10%; CITRUS, 3%; OTHER FIELD CROPS, 7% (1982).**PEER REVIEWED** [SRI
2. (1978) 1.09X10+9 G (CONSUMPTION-INCL IMPORTS) **PEER REVIEWED** [SRI

3. (1982) 1.36X10+9 G (CONSUMPTION-INCL IMPORTS) **PEER REVIEWED** [SRI

U.S. Imports:

1. (1978) 7.18X10+7 G (PRINCPL CUSTMS DISTS) **PEER REVIEWED** [SRI
2. (1982) 4.85X10+7 G (PRINCPL CUSTMS DISTS) **PEER REVIEWED** [SRI

CHEMICAL & PHYSICAL PROPERTIES

Color/Form:

1. Colorless crystals **QC REVIEWED** [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987. 41
2. BROWN WAXY SOLID **QC REVIEWED** [Sax, N.I. and R.J. Lewis, Sr. (eds.). Hawley's Condensed Chemical Dictionary. 11th ed. New York: Van Nostrand Reinhold Co., 1987. 110
3. Colorless crystalls or a brown waxy solid. **QC REVIEWED** [NIOSH. NIOSH Pocket Guide to Chemical Hazards. DHHS (NIOSH) Publication No. 94-116. Washington, D.C.: U.S. Government Printing Office, June 1994. 22

Melting Point:

1. 73-74 DEG C **PEER REVIEWED** [The Merck Index. 10th ed. Rahway, New Jersey: Merck Co., Inc., 1983. 131

Molecular Weight:

1. 317.34 **PEER REVIEWED** [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry ofToxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLARS file.,p. 86/8606

Corrosivity:

1. Non-corrosive **QC REVIEWED** [Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987.,p. A026/AUG 87

Density/Specific Gravity:

1. 1.44 @ 20 DEG C/4 DEG C **PEER REVIEWED** [The Merck Index. 10th ed. Rahway, New Jersey: Merck Co., Inc., 1983. 131

Heat of Combustion:

1. -8,600 Btu/lb= -4,800 cal/g= -200X10+5 J/k (est) **QC REVIEWED** [U.S. Coast Guard, Department of Transportation. CHRIS - Hazardous Chemical Data. Volume II. Washington, D.C.: U.S. Government Printing Office, 1984-5.

Octanol/Water Partition Coefficient:

1. log Kow= 2.75 (measured) **QC REVIEWED** [Hansch, C. and A. Leo. The Log P Database. Claremont, CA: Pomona College, 1987. 368

Solubilities:

1. SOL IN METHANOL, ETHANOL, PROPYLENE GLYCOL, XYLENE, OTHER ORGANIC SOLVENTS **PEER REVIEWED** [The Merck Index. 10th ed. Rahway, New Jersey: Merck Co., Inc., 1983. 131
2. 33 ppm in water @ 20 deg C **QC REVIEWED** [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987. 41
3. > 1 kg/l dichloromethane **QC REVIEWED** [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987. 41
4. > 1 kg/l toluene **QC REVIEWED** [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987. 41

Spectral Properties:

1. INDEX OF REFRACTION: 1.6115 @ 76 DEG C/D **PEER REVIEWED** [Spencer, E. Y. Guide to the Chemicals Used in Crop Protection. 7th ed. Publication 1093. Research Institute, Agriculture Canada, Ottawa, Canada: Information Canada, 1982. 27
2. Intense mass spectral peaks: 132 m/z (100%), 77 m/z (91%), 160 m/z (45%), 104 m/z (33%) **QC REVIEWED** [Hites, R.A. Handbook of Mass Spectra of Environmental Contaminants. Boca Raton, FL: CRC Press Inc., 1985. 327
3. Intense mass spectral peaks: 93 m/z, 317 m/z **QC REVIEWED** [Pfleger, K., H. Maurer and A. Weber. Mass Spectral and GC Data of Drugs, Poisons and their Metabolites. Parts I and II. Mass Spectra Indexes. Weinheim, FederalRepublic of Germany. 1985. 559

Vapor Pressure:

1. Less than 1 mPa at 20 deg C **QC REVIEWED** [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987. 41

Other Chemical/Physical Properties:

1. Recrystallizable from methanol and isopropanol **QC REVIEWED** [Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. Old Woking, Surrey, United Kingdom: Royal Society of Chemistry/Unwin Brothers Ltd., 1983.,p. A026/Oct 83
2. Decomposes above 200 deg C **QC REVIEWED** [Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987.,p. A026/Aug 87
3. RAPIDLY HYDROLYZED BY COLD ALKALI OR ACID **QC REVIEWED** [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK:

The British Crop Protection Council, 1987. 41

SAFETY & HANDLING

Emergency Guidelines

DOT Emergency Guidelines:

1. Health Hazards: Poisonous; may be fatal if inhaled, swallowed or absorbed through skin. Contact may cause burns to skin and eyes. Runoff from fire control or dilution water may give off poisonous gases and cause water pollution. Fire may produce irritating or poisonous gases. **QC REVIEWED** [Department of Transportation. Emergency Response Guidebook 1987. DOT P 5800.4. Washington, DC: U.S. Government Printing Office, 1987.,p. G-55
2. Fire or Explosion: Some of these materials may burn, but none of them ignites readily. Container may explode violently in heat of fire. **QC REVIEWED** [Department of Transportation. Emergency Response Guidebook 1987. DOT P 5800.4. Washington, DC: U.S. Government Printing Office, 1987.,p. G-55
3. Emergency Action: Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind, out of low areas, and ventilate closed spaces before entering. Self contained breathing apparatus and chemical protective clothing which is specifically recommended by the shipper or producer may be worn but they do not provide thermal protection unless it is stated by the clothing manufacturer. Structural firefighter's protective clothing is not effective with these materials. Remove and isolate contaminated clothing at the site. CALL CHEMTREC AT 1-800-424-9300 AS SOON AS POSSIBLE, especially if there is no local hazardous materials team available. **QC REVIEWED** [Department of Transportation. Emergency Response Guidebook 1987. DOT P 5800.4. Washington, DC: U.S. Government Printing Office, 1987.,p. G-55
4. Fire: Small Fires: Dry chemical, CO2, Halon, water spray or standard foam. Large Fires: Water spray, fog or standard foam is recommended. Move container from fire area if you can do it without risk. Fight fire from maximum distance. Stay away from ends of tanks. Dike fire control water for later disposal; do not scatter the material. **QC REVIEWED** [Department of Transportation. Emergency Response Guidebook 1987. DOT P 5800.4. Washington, DC: U.S. Government Printing Office, 1987.,p. G-55
5. Spill or Leak: Do not touch spilled material; stop leak if you can do it without risk. Use water spray to reduce vapors. Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal. Small Dry Spills: With

clean shovel place material into clean, dry container and cover; move containers from spill area. Large Spills: Dike far ahead of liquid spill for later disposal. **QC REVIEWED** [Department of Transportation. Emergency Response Guidebook 1987. DOT P 5800.4. Washington, DC: U.S. Government Printing Office, 1987.,p. G-55

6. First Aid: Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation. **QC REVIEWED** [Department of Transportation. Emergency Response Guidebook 1987. DOT P 5800.4. Washington, DC: U.S. Government Printing Office, 1987.,p. G-55

Fire Fighting Information

Fire Fighting Procedures:

1. Self contained breathing apparatus with a full facepiece operated in pressure demand or other positive pressure mode /when fighting fire/. **QC REVIEWED** [Mackison, F. W., R. S. Stricoff, and L. J. Partridge, Jr. (eds.). NIOSH/OSHA - Occupational Health Guidelines for Chemical Hazards. DHHS(NIOSH) PublicationNo. 81-123 (3 VOLS). Washington, DC: U.S. Government Printing Office, Jan. 1981. 5
2. If material is on fire or involved in a fire: Use water in flooding quantities as fog. Solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water. Apply water from as far a distance as possible. Use foam, dry chemical, or carbon dioxide. Keep run off water out of sewers and water sources. /Azinphos methyl (or) guthion (agricultural insecticides, not elsewhere classified, other than liquid)/ **QC REVIEWED** [Association of American Railroads. Emergency Handling of Hazardous Materials in Surface Transportation. Washington, D.C.: Assoc. of American Railroads,Hazardous Materials Systems (BOE), 1987. 71
3. If material is on fire or involved in a fire: Do not extinguish fire unless flow can be stopped. Use water in flooding quantities as fog. Solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water. Apply water from as far a distance as possible. Use foam, dry chemical, or carbon dioxide. Keep run off water out of sewers and water sources. /Azinphos methyl (or) guthion (agricultural insecticides, not

elsewhere classified, liquid)/ **QC REVIEWED**
[Association of American Railroads. Emergency Handling of Hazardous Materials in Surface Transportation. Washington, D.C.: Assoc. of American Railroads,Hazardous Materials Systems (BOE), 1987. 71

Toxic Combustion Products:

1. Hazardous decomposition products: Toxic gases and vapors (such as sulfur dioxide, oxides of nitrogen, phosphoric acid mist, and carbon monoxide) may be released from a fire involving azinphos methyl. **QC REVIEWED** [Mackison, F. W., R. S. Stricoff, and L. J. Partridge, Jr. (eds.). NIOSH/OSHA - Occupational Health Guidelines for Chemical Hazards. DHHS(NIOSH) PublicationNo. 81-123 (3 VOLS). Washington, DC: U.S. Government Printing Office, Jan. 1981. 2

Explosive Limits and Potential:

1. When exposed to high temperatures or flame, the containers may explode. **QC REVIEWED** [Association of American Railroads. Emergency Handling of Hazardous Materials in Surface Transportation. Washington, D.C.: Assoc. of American Railroads,Hazardous Materials Systems (BOE), 1987. 71

Hazardous Reactions

Reactivities and Incompatibilities:

1. Incompatibilities: Contact with strong oxidizers may cause fires and explosions. **PEER REVIEWED** [Mackison, F. W., R. S. Stricoff, and L. J. Partridge, Jr. (eds.). NIOSH/OSHA - Occupational Health Guidelines for Chemical Hazards. DHHS(NIOSH) PublicationNo. 81-123 (3 VOLS). Washington, DC: U.S. Government Printing Office, Jan. 1981. 2

Decomposition:

1. ... decomposes at elevated temperatures **QC REVIEWED** [Purdue University; National Pesticide Information Retrieval System (1988)

Warning Properties

Odor Threshold:

1. Detection: 0.0002 mg/kg water **QC REVIEWED** [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983. 226

Skin, Eye, and Respiratory Irritations:

1. Irritating to eyes and skin. **QC REVIEWED** [Commission of the European Communities. Legislation on Dangerous Substances - Classification and Labelling in the European Communities. Vol. II. London and Trotman Ltd., 1989. 98

Preventive Measures

Protective Equipment and Clothing:

1. Employees should be provided with and required to use

impervious clothing ... face shields (eight-inch minimum), and other appropriate protective clothing necessary to prevent skin contact with azinphos-methyl or liquids containing azinphos-methyl, where skin contact may occur. **QC REVIEWED** [Mackison, F. W., R. S. Stricoff, and L. J. Partridge, Jr. (eds.). NIOSH/OSHA - Occupational Health Guidelines for Chemical Hazards. DHHS(NIOSH) PublicationNo. 81-123 (3 VOLS). Washington, DC: U.S. Government Printing Office, Jan. 1981. 3

2. Employees should be provided with and required to use dust and splash proof safety goggles where azinphos-methyl or liquids containing azinphos-methyl may contact the eyes. **QC REVIEWED** [Mackison, F. W., R. S. Stricoff, and L. J. Partridge, Jr. (eds.). NIOSH/OSHA - Occupational Health Guidelines for Chemical Hazards. DHHS(NIOSH) PublicationNo. 81-123 (3 VOLS). Washington, DC: U.S. Government Printing Office, Jan. 1981. 3
3. Wear boots, protective gloves ... /Azinophos methyl (or) guthion (agricultural insecticides, not elsewhere specified, liquid)/ **QC REVIEWED** [Association of American Railroads. Emergency Handling of Hazardous Materials in Surface Transportation. Washington, D.C.: Assoc. of American Railroads,Hazardous Materials Systems (BOE), 1987. 71
4. Wear ... natural rubber gloves ... **QC REVIEWED** [Farm Chemicals Handbook 1989. Willoughby, OH: Meister Publishing Co., 1989.,p. C-31
5. Wear appropriate personal protective clothing to prevent skin contact. **QC REVIEWED** [NIOSH. NIOSH Pocket Guide to Chemical Hazards. DHHS (NIOSH) Publication No. 94-116. Washington, D.C.: U.S. Government Printing Office, June 1994. 22
6. Wear appropriate eye protection to prevent eye contact. **QC REVIEWED** [NIOSH. NIOSH Pocket Guide to Chemical Hazards. DHHS (NIOSH) Publication No. 94-116. Washington, D.C.: U.S. Government Printing Office, June 1994. 22
7. Facilities for quickly drenching the body should be provided within the immediate work area for emergency use where there is a possibility of exposure. [Note: It is intended that these facilities should provide a sufficient quantity or flow of water to quickly remove the substance from any body areas likely to be exposed. The actual determination of what constitutes an adequate quick drench facility depends on the specific circumstances. In certain instances, a deluge shower should be readily available, whereas in others, the availability of water from a sink or hose could be considered adequate.] **QC REVIEWED** [NIOSH. NIOSH Pocket Guide to Chemical Hazards. DHHS (NIOSH) Publication No. 94-116. Washington, D.C.: U.S.

Government Printing Office, June 1994. 22

8. Recommendations for respirator selection. Max concn for use: 2 mg/cu m. Respirator Class(es): Any chemical cartridge respirator with organic vapor cartridge(s) in combination with a dust, mist, and fume filter. Any supplied-air respirator. **QC REVIEWED** [NIOSH. NIOSH Pocket Guide to Chemical Hazards. DHHS (NIOSH) Publication No. 94-116. Washington, D.C.: U.S. Government Printing Office, June 1994. 22
9. Recommendations for respirator selection. Max concn for use: 5 mg/cu m. Respirator Class(es): Any supplied-air respirator operated in a continuous flow mode. Any powered, air-purifying respirator with organic vapor cartridge(s) in combination with a dust, mist, and fume filter. **QC REVIEWED** [NIOSH. NIOSH Pocket Guide to Chemical Hazards. DHHS (NIOSH) Publication No. 94-116. Washington, D.C.: U.S. Government Printing Office, June 1994. 22
10. Recommendations for respirator selection. Max concn for use: 10 mg/cu m. Respirator Class(es): Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s) in combination with a high-efficiency particulate filter. Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister having a high-efficiency particulate filter. Any powered, air-purifying respirator with a tight-fitting facepiece and organic vapor cartridge(s) in combination with a high-efficiency particulate filter. Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode. Any self-contained breathing apparatus with a full facepiece. Any supplied-air respirator with a full facepiece. **QC REVIEWED** [NIOSH. NIOSH Pocket Guide to Chemical Hazards. DHHS (NIOSH) Publication No. 94-116. Washington, D.C.: U.S. Government Printing Office, June 1994. 22
11. Recommendations for respirator selection. Condition: Emergency or planned entry into unknown concn or IDLH conditions: Respirator Class(es): Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode. Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode. **QC REVIEWED** [NIOSH. NIOSH Pocket Guide to Chemical Hazards. DHHS (NIOSH) Publication No. 94-116. Washington, D.C.: U.S. Government Printing Office, June 1994. 22

12. Recommendations for respirator selection. Condition: Escape from suddenly occurring respiratory hazards: Respirator Class(es): Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister having a high-efficiency particulate filter. Any appropriate escape-type, self-contained breathing apparatus. **QC REVIEWED** [NIOSH. NIOSH Pocket Guide to Chemical Hazards. DHHS (NIOSH) Publication No. 94-116. Washington, D.C.: U.S. Government Printing Office, June 1994. 22

Other Protective Measures:

1. Contact lenses should not be worn when working with this chemical. **QC REVIEWED** [NIOSH. Pocket Guide to Chemical Hazards. 2nd Printing. DHHS (NIOSH) Publ. No. 85-114. Washington, D.C.: U.S. Dept. of Health and Human Services, NIOSH/Supt.of Documents, GPO, February 1987. 55
2. Contact lens use in industry is controversial. A survey of 100 corporations resulted in the recommendation that each company establish their own contact lens use policy. One presumed hazard of contact lens use is possible chemical entrapment. /It was/ found that contact lens minimized injury or protected the eye. The eye was afforded more protection from liquid irritants. Soft contact lenses do not worsen corneal damage from strong chemicals and in some cases could actually protect the eye. Overall, the literature supports the wearing of contact lenses in industrial environments as part of the standard eye protection, eg, face shields; however, more data are needed to establish the value of contact lenses. **QC REVIEWED** [Randolph SA, Zavon MR; J Occup Med 29: 237-42 (1987)
3. Respirators may be used when engineering and work practice controls are not technically feasible, when such controls are in the process of being installed, or when they fail and need to be supplemented. Respirators may also be used for operations which require entry into tanks or closed vessels, and in emergency situations. If the use of respirators is necessary, the only respirators permitted are those that have been approved by the Mine Safety and Health Administration (formerly Mining Enforcement and Safety Administration) or by the National Institute for Occupational Safety and Health. In addition to respirator selection, a complete respiratory protection program should be instituted which includes regular training, maintenance, inspection, cleaning, and evaluation. **PEER REVIEWED** [Mackison, F. W., R. S. Stricoff, and L. J. Partridge, Jr. (eds.). NIOSH/OSHA - Occupational Health Guidelines for Chemical Hazards. DHHS(NIOSH) PublicationNo. 81-123 (3 VOLS). Washington, DC: U.S.

Government Printing Office, Jan. 1981. 3

4. If an employees' clothing has had any possibility of being contaminated with azinphos-methyl or liquids containing azinphos-methyl, employees should change into uncontaminated clothing before leaving the work premises. **PEER REVIEWED** [Mackison, F. W., R. S. Stricoff, and L. J. Partridge, Jr. (eds.). NIOSH/OSHA - Occupational Health Guidelines for Chemical Hazards. DHHS(NIOSH) PublicationNo. 81-123 (3 VOLS). Washington, DC: U.S. Government Printing Office, Jan. 1981. 3
5. Clothing contaminated with azinphos-methyl should be placed in closed containers for storage until it can be discarded or until provision is made for the removal of azinphos-methyl from the clothing. If the clothing is to be laundered or otherwise cleaned to remove the azinphos-methyl the person performing the operation should be informed of azinphos-methyl's hazardous properties. **QC REVIEWED** [Mackison, F. W., R. S. Stricoff, and L. J. Partridge, Jr. (eds.). NIOSH/OSHA - Occupational Health Guidelines for Chemical Hazards. DHHS(NIOSH) PublicationNo. 81-123 (3 VOLS). Washington, DC: U.S. Government Printing Office, Jan. 1981. 3
6. Where exposure of an employee's body to azinphos-methyl or liquids containing azinphos-methyl may occur, facilities for quick drenching of the body should be provided within the immediate work area for emergency use. **PEER REVIEWED** [Mackison, F. W., R. S. Stricoff, and L. J. Partridge, Jr. (eds.). NIOSH/OSHA - Occupational Health Guidelines for Chemical Hazards. DHHS(NIOSH) PublicationNo. 81-123 (3 VOLS). Washington, DC: U.S. Government Printing Office, Jan. 1981. 3
7. Non impervious clothing which becomes contaminated with azinphos-methyl should be removed immediately and not reworn until the azinphos-methyl is removed from the clothing. **QC REVIEWED** [Mackison, F. W., R. S. Stricoff, and L. J. Partridge, Jr. (eds.). NIOSH/OSHA - Occupational Health Guidelines for Chemical Hazards. DHHS(NIOSH) PublicationNo. 81-123 (3 VOLS). Washington, DC: U.S. Government Printing Office, Jan. 1981. 3
8. If material is not on fire and not involved in a fire: Keep sparks, flames, and other sources of ignition away; Keep material out of water sources and sewers; Build dikes to contain flow as necessary; Attempt to stop leak if without hazard; Use water spray to knock down vapors. /Azinphos methyl (or) guthion (agricultural insecticides, not elsewhere classified, liquid)/ **QC REVIEWED** [Association of American Railroads. Emergency Handling of Hazardous Materials in Surface Transportation. Washington, D.C.: Assoc. of American Railroads,Hazardous Materials

Systems (BOE), 1987. 71

9. Avoid breathing dusts, and fumes from burning material. Keep upwind. Avoid bodily contact with the material. Do not handle broken packages without protective equipment. Wash away any material which may have contacted the body with copious amounts or water or soap and water. /Azinophos methyl (or) guthion (agricultural insecticides, not elsewhere classified, other than liquid)/ **QC REVIEWED** [Association of American Railroads. Emergency Handling of Hazardous Materials in Surface Transportation. Washington, D.C.: Assoc. of American Railroads,Hazardous Materials Systems (BOE), 1987. 71
10. Avoid breathing vapors. Keep upwind. Avoid bodily contact with the material. Do not handle broken packages without protective equipment. Wash away any material which may have contacted the body with copious amounts or water or soap and water. /Azinophos methyl, liquid (or) guthion (agricultural insecticides, not otherwise specified, liquid)/ **QC REVIEWED** [Association of American Railroads. Emergency Handling of Hazardous Materials in Surface Transportation. Washington, D.C.: Assoc. of American Railroads,Hazardous Materials Systems (BOE), 1987. 72
11. SRP: Contaminated protective clothing should be segregated in such a manner so that there is no direct personal contact by personnel who handle, dispose, or clean the clothing. Quality assurance to ascertain the completeness of the cleaning procedures should be implemented before the decontaminated protective clothing is returned for reuse by the workers. Contaminated clothing should not be taken home at end of shift, but should remain at employee's place of work for cleaning. **QC REVIEWED**
12. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). **QC REVIEWED** [Commission of the European Communities. Legislation on Dangerous Substances - Classification and Labelling in the European Communities. Vol. II. London and Trotman Ltd., 1989.,p. IV-591
13. The worker should immediately wash the skin when it becomes contaminated. **QC REVIEWED** [NIOSH. NIOSH Pocket Guide to Chemical Hazards. DHHS (NIOSH) Publication No. 94-116. Washington, D.C.: U.S. Government Printing Office, June 1994. 22
14. Work clothing that becomes wet or significantly contaminated should be removed or replaced. **QC REVIEWED** [NIOSH. NIOSH Pocket Guide to Chemical Hazards. DHHS (NIOSH) Publication No. 94-116. Washington, D.C.: U.S. Government Printing Office, June 1994. 22
15. Workers whose clothing may have become contaminated should

change into uncontaminated clothing before leaving the work premises. **QC REVIEWED** [NIOSH. NIOSH Pocket Guide to Chemical Hazards. DHHS (NIOSH) Publication No. 94-116. Washington, D.C.: U.S. Government Printing Office, June 1994. 22

Other Safety & Handling

Stability/Shelf Life:

1. IT IS UNSTABLE @ TEMP ABOVE 200 DEG C. **QC REVIEWED** [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987. 41
2. SOLUTIONS IN ETHANOL AND PROPYLENE GLYCOL ARE STABLE FOR @ LEAST 3 WK. **QC REVIEWED** [The Merck Index. 10th ed. Rahway, New Jersey: Merck Co., Inc., 1983. 131
3. High temperatures cause gas evolution and may develop pressure in sealed containers. **QC REVIEWED** [Mackison, F. W., R. S. Stricoff, and L. J. Partridge, Jr. (eds.). NIOSH/OSHA - Occupational Health Guidelines for Chemical Hazards. DHHS(NIOSH) PublicationNo. 81-123 (3 VOLS). Washington, DC: U.S. Government Printing Office, Jan. 1981. 2

Shipment Methods and Regulations:

1. No person may /transport,/ offer or accept a hazardous material for transportation in commerce unless that material is properly classed, described, packaged, marked, labeled, and in condition for shipment as required or authorized by ... /the hazardous materials regulations (49 CFR 171-177)./ **PEER REVIEWED** [49 CFR 171.2 (10/1/87)
2. Domestic Transportation: Chemical: Azinphosmethyl mixture, liquid. Primary Hazard Class: Poison B; Less Dangerous Poisons: Substances, liquids, or solids, other than Class A or Irritating materials, which are known to be so toxic to man as to afford a hazard to health during transportation, or which, in the absence of adequate data on human toxicity, are presumed to be toxic to man. NA 2783. Label(s) required: Poison. Acceptable Modes of Transportation: Air, rail, road, and water. **QC REVIEWED** [49 CFR 172.101 (10/1/87)

Storage Conditions:

1. Keep locked up. Keep away from food, drink and animal feeding stuffs. **QC REVIEWED** [Commission of the European Communities. Legislation on Dangerous Substances - Classification and Labelling in the European Communities. Vol. II. London and Trotman Ltd., 1989. 98
2. Store in a cool dry area, away from excessive heat or open flame. Store 2L formulation above 45 deg F; others above 32 deg F. Store in an area designated specifically for pesticides. **QC REVIEWED** [Farm Chemicals Handbook 1989. Willoughby, OH: Meister Publishing Co., 1989.,p. C-31

Cleanup Methods:

1. Environmental considerations land spill: Dig a pit, pond, lagoon, or holding area to contain liquid or solid material. /SRP: If time permits, pits, ponds, lagoons, soak holes, or holding areas should be sealed with an impermeable flexible membrane liner./ Cover solids with a plastic sheet to prevent dissolving in rain or fire fighting water. /Azinphos methyl (or) guthion (agricultural insecticides, not elsewhere classified, other than liquid)/ **QC REVIEWED** [Association of American Railroads. Emergency Handling of Hazardous Materials in Surface Transportation. Washington, D.C.: Assoc. of American Railroads,Hazardous Materials Systems (BOE), 1987. 71
2. Environmental considerations land spill: Dig a pit, pond, lagoon, holding area to contain liquid or solid material. /SRP: If time permits, pits, ponds, lagoons, soak holes, or holding areas should be sealed with an impermeable flexible membrane liner./ Dike surface flow using soil, sand bags, foamed polyurethane, or foamed concrete. Absorb bulk liquid with fly ash or cement powder. /Azinphos methyl mixture, liquid (or) guthion mixture, liquid (agricultural insecticides, not elsewhere classified, liquid) and Azinophos methyl (or) guthion (agricultural insecticides, not elsewhere classified, liquid)/ **QC REVIEWED** [Association of American Railroads. Emergency Handling of Hazardous Materials in Surface Transportation. Washington, D.C.: Assoc. of American Railroads,Hazardous Materials Systems (BOE), 1987. 71
3. Environmental considerations water spill: If dissolved, apply activated carbon at ten times the spilled amount in region of 10 ppm or greater concn. Use mechanical dredges, or lifts to remove immobilized masses of pollutants and precipitates. /Azinphos methyl or Guthion (agricultural insecticides, not elsewhere classified, liquid; Azinphos methyl (or) guthion (insecticides, other than agricultural, not elsewhere classified); Azinphos methyl mixture, liquid (or) guthion mixture, liquid (agricultural insecticides, not elsewhere classified, liquid)/ **QC REVIEWED** [Association of American Railroads. Emergency Handling of Hazardous Materials in Surface Transportation. Washington, D.C.: Assoc. of American Railroads,Hazardous Materials Systems (BOE), 1987. 71
4. Environmental considerations air spill: Apply water spray or mist to knock down vapors. /Azinphos methyl (or) guthion (agricultural insecticides, not elsewhere classified, liquid); Azinphos methyl (or) guthion (insecticides, other than agricultural, not elsewhere classified; Azinphos methyl mixture, liquid (or) guthion

mixture, liquid (agricultural insecticides, not elsewhere classified, liquid)/ **QC REVIEWED** [Association of American Railroads. Emergency Handling of Hazardous Materials in Surface Transportation. Washington, D.C.: Assoc. of American Railroads,Hazardous Materials Systems (BOE), 1987. 71

Disposal Methods:

1. 1. BY MAKING PACKAGES OF AZINPHOS-METHYL IN PAPER OR OTHER FLAMMABLE MATERIAL AND BURNING IN A SUITABLE COMBUSTION CHAMBER EQUIPPED WITH AN APPROPRIATE EFFLUENT GAS CLEANING DEVICE. 2. BY DISSOLVING AZINPHOS-METHYL IN A FLAMMABLE SOLVENT (SUCH AS ALC) AND ATOMIZING IN A SUITABLE COMBUSTION CHAMBER EQUIPPED WITH AN APPROPRIATE EFFLUENT GAS CLEANING DEVICE. **PEER REVIEWED** [Mackison, F. W., R. S. Stricoff, and L. J. Partridge, Jr. (eds.). NIOSH/OSHA - Occupational Health Guidelines for Chemical Hazards. DHHS(NIOSH) PublicationNo. 81-123 (3 VOLS). Washington, DC: U.S. Government Printing Office, Jan. 1981. 4
2. Group I Containers: Combustible containers from organic or metallo-organic pesticides (except organic mercury, lead, cadmium, or arsenic compounds) should be disposed of in pesticide incinerators or in specified landfill sites. /Organic or metallo-organic pesticides/ **QC REVIEWED** [40 CFR 165.9 (a) (7/1/88)
3. Group II Containers: Non-combustible containers from organic or metallo-organic pesticides (except organic mercury, lead, cadmium, or arsenic compounds) must first be triple-rinsed. Containers that are in good condition may be returned to the manufacturer or formulator of the pesticide product, or to a drum reconditioner for reuse with the same type of pesticide product, if such reuse is legal under Department of Transportation regulations (eg 49 CFR 173.28). Containers that are not to be reused should be punctured ... and transported to a scrap metal facility for recycling, disposal or burial in a designated landfill. /Organic or metallo-organic pesticides/ **QC REVIEWED** [40 CFR 165.9 (b) (7/1/88)
4. Landfill: Mix azinphos-methyl with excess calcium oxide or sodium hydroxide & sand or other adsorbent in a pit or trench at least 0.5 m deep in a clay soil. Sodium hydroxide (or sodium carbonate) can also be added to the mixture to help speed the reactions when calcium oxide is used as the main alkali. The amt of calcium oxide or sodium hydroxide to use depends on the amt of pesticide to be disposed of and, to some extent, the concentration of active ingredient in the pesticide and the actual chemical nature of the active ingredient. A practical guideline, in the absence of specific directions, is to use an approx

volume or weight of alkali from one-half of to the same as that of the pesticide. For dilute formulations, such as a 1% soln or dust, the amt of calcium oxide or sodium hydroxide can be reduced by one-half. For very concentrated pesticides (over 80% active ingredient) the amt of calcium oxide or sodium hydroxide can be doubled, but the concentrate should be mixed first with water (or soapy water) before reaction with the alkali. For safety, a preliminary test should be made in which very small amt of the pesticide and alkali are mixed and observed briefly to make sure it does not react too vigorously. Sizable quantities of pesticides can be disposed of in several smaller batches, rather than ali at once, for added safety. 50% hydrolysis @ pH 9 and 70 deg C requires 0.6 hr; 8-9 hr @ pH 5 and 70 deg C, 240 days @ pH 5 and 20 deg C. Recommendable methods: Incineration, chemical treatment, & discharge to sewer. Peer-review: This highly toxic material is rapidly hydrolyzed by cold alkali. Use 5 parts by volume 4% wt/vol sodium hydroxide soln to 1 volume of pesticide. Hydrolysis is improved by making the sodium hydroxide soln in 50% ethanol. Use much water to wash reaction mixture down to sewer. Large amt - Incinerate in a unit with effluent gas scrubbing. (Peer-review conclusions of an IRPTC expert consultation (May 1985)) **QC REVIEWED** [United Nations. Treatment and Disposal Methods for Waste Chemicals (IRPTC File). Data Profile Series No. 5. Geneva, Switzerland: United Nations Environmental Programme, Dec. 1985. 244

5. Hydrolysis: Alkaline hydrolysis leads to complete degradation: the alkaline salt of dimethyldithiophosphoric acid and the anthranilic acid formed are nontoxic. Oxidation: Complete degradation but the gutoxon formed is equally toxic. For the decontamination of glass and metal containers triple rinse and use of a rinse soln containing caustic soda and detergent are considered. **QC REVIEWED** [United Nations. Treatment and Disposal Methods for Waste Chemicals (IRPTC File). Data Profile Series No. 5. Geneva, Switzerland: United Nations Environmental Programme, Dec. 1985. 244

TOXICITY/BIOMEDICAL EFFECTS

Summary

Medical Surveillance:

1. The following procedures should be made available to each employee who is exposed to azinphosmethyl at potentially hazardous levels: Initial Medical Examination: A complete history and physical examination: The purpose is to detect existing conditions that might place the exposed employee at increased risk, and to establish a baseline for future health monitoring. Persons with a history of reduced

pulmonary function, convulsive disorders, or recent exposures to anticholinesterase agents would be expected to be at increased risk from exposure. Examination of the respiratory system, nervous system, cardiovascular system, and attention to the cholinesterase levels in the blood should be stressed. The skin should be examined for evidence of chronic disorders. Cholinesterase determination: Azinphos methyl causes depressed levels of activity of cholinesterase in the serum and erythrocytes. The cholinesterase activity in the serum and erythrocytes should be determined by using medically acceptable biochemical tests prior to any new period of exposure. Periodic Medical Examination: The aforementioned medical examinations should be repeated on an annual basis, with the exception of the cholinesterase determination which should be performed quarterly or at any time overexposure is suspected or signs and symptoms of toxicity occur. **QC REVIEWED** [Mackison, F. W., R. S. Stricoff, and L. J. Partridge, Jr. (eds.). NIOSH/OSHA - Occupational Health Guidelines for Chemical Hazards. DHHS(NIOSH) PublicationNo. 81-123 (3 VOLS). Washington, DC: U.S. Government Printing Office, Jan. 1981. 1

2. ... One of the components in risk assessment is the determination of the amount of pesticide to which the applicator is exposed. Traditional methods estimated dermal exposure by measuring the amount of pesticide deposited on absorbent patches worn on the applicator's body. A more recent approach consists of measuring urinary metabolite levels. A review of data obtained in humans and in rats suggests that urinary concentration of dimethyl thiophosphate is a good indicator of dermal exposure to azinphos-methyl. **QC REVIEWED** [Franklin CA; Can J Physiol Pharmacol 62 (8): 1037-39 (1984)

Toxicity Excerpts

Human Toxicity Excerpts:

1. Target organs: respiratory system, central nervous system, cardiovascular system, blood cholinesterase. **QC REVIEWED** [NIOSH. Pocket Guide to Chemical Hazards. 2nd Printing. DHHS (NIOSH) Publ. No. 85-114. Washington, D.C.: U.S. Dept. of Health and Human Services, NIOSH/Supt.of Documents, GPO, February 1987. 55
2. Symptoms: Mild: headache, anorexia and nausea, weakness, vertigo, blurred vision, miosis. Moderate: vomiting, abdominal cramps and diarrhea, salivation, lacrimation, sweating, shortness of breath, substernal tightness, slow pulse, tremor of extremities & muscular cramps, ataxia. Severe: pyrexia, cyanosis, pulmonary edema, areflexia and loss of sphincter, convulsion, coma, heat block, shock, respiratory failure. **QC REVIEWED** [ITII. Toxic and

Hazarous Industrial Chemicals Safety Manual. Tokyo, Japan:
The International Technical Information Institute, 1982.
328

3. A POTENT CHOLINESTERASE INHIBITOR IN VIVO. DEATH IS DUE TO RESPIRATORY FAILURE. **PEER REVIEWED** [Gosselin, R.E., R.P. Smith, H.C. Hodge. Clinical Toxicology of Commercial Products. 5th ed. Baltimore: Williams and Wilkins, 1984.,p. II-297
4. BLOOD ACETYLCHOLINESTERASE & PSEUDOCHOLINESTERASE ACTIVITY WERE MEASURED IN 15 MALE AGRICULTURE FIELD WORKERS DURING A FIVE DAY THINNING OPERATION IN NORTHERN CALIFORNIA PEACH ORCHARD. EIGHT MEN WERE RANDOMLY ASSIGNED TO WORK IN AN GUTHION TREATED PLOT, AND SEVEN MEN TO WORK IN AN ADJOINING PLOT FREE FROM ORGANOPHOSPHATE RESIDUES. FOLIAGE SAMPLES WERE TAKEN TO MEASURE DISLODGEABLE AND TOTAL GUTHION RESIDUES. THE DAILY MEAN PERCENT CHANGE IN ACETYLCHOLINESTERASE AND PSEUDOCHOLINESTERASE ACTIVITY WAS LESS THAN -10% OF BASELINE VALUES FOR EACH GROUP OF MEN. MEAN ACETYLCHOLINESTERASE ACTIVITY OF WORKERS IN THE GUTHION TREATED PLOT WAS DIFFERENT FROM THAT OF WORKERS IN THE CONTROL PLOT. **QC REVIEWED** [RICHARDS DM ET AL; J ENVIRON PATHOL TOXICOL 2 (2): 493-512 (1978)
5. PICKERS ENTERING THE CITRUS FIELD 7 DAYS AFTER SPRAYING WITH AZINPHOS METHYL (PREPARED FROM A WETTABLE POWDER 6 OZ/100 GALLONS) SHOWED A DEPRESSION OF PLASMA CHOLINESTERASE (BLOOD ANALYSIS AT THE END OF THE 10TH DAY AFTER SPRAYING). WORKERS PICKING FRUIT SPRAYED WITH A LOWER CONCENTRATION SHOWED A DEPRESSION OF ERYTHROCYTE CHOLINESTERASE BUT NOT OF THE PLASMA ENZYME. THE DECLINE OF AZINPHOS METHYL RESIDUES ON CITRUS WAS NOT RAPID DURING THE FIRST 30 DAYS FOLLOWING APPLICATION. DERMAL EXPOSURE APPEARED TO BE MORE SERIOUS THAN INHALATION EXPOSURE. **QC REVIEWED** [LAMB DW; STUD ENVIRON SCI 7: 121-27 (1980)

Non-Human Toxicity Excerpts:

1. POSTWEANING WISTAR RATS /WERE FED AZINPHOSMETHYL/ @ 5, 20, & 50 PPM FOR 2 YR WITH 40 OF EACH SEX IN EACH DOSAGE GROUP. 23 WK AFTER BEGINNING OF STUDY, DOSAGE OF 2.5 PPM WAS ADDED; AFTER 47 WK, 50 PPM DOSAGE WAS INCR TO 100 PPM. NO ADVERSE EFFECTS WERE OBSERVED IN THE 50 PPM GROUP, BUT INCR THE DOSAGE TO 100 PPM RESULTED IN CONVULSIVE EPISODES IN SEVERAL ANIMALS AND A CONSISTENT DECREASE IN PLASMA & RED CELL CHOLINESTERASE ACTIVITY. **QC REVIEWED** [National Research Council. Drinking Water & Health Volume 1. Washington, DC: National Academy Press, 1977. 605
2. CATTLE TREATED EXTERNALLY WITH 20% AZINPHOS-METHYL SOLN IN MISTAKE FOR DDT SHOWED TYPICAL SYMPTOMS OF POISONING, SEVERAL ANIMALS DYING. **PEER REVIEWED** [Clarke, M. L., D. G. Harvey and D. J. Humphreys. Veterinary Toxicology. 2nd ed. London: Bailliere Tindall, 1981. 148

3. DOSES OF 0, 1.25, 2.5, & 5.0 MG/KG/DAY WERE GIVEN TO PREGNANT RATS & MICE FOR 10 DAYS STARTING ON GESTATIONAL DAY 6. HIGH DOSE AFFECTED MATERNAL WELFARE ONLY IN RATS. GUTHION (AZINPHOS-METHYL) DID NOT SIGNIFICANTLY INCR IN A DOSE RELATED MANNER ANY OF THE SPECIFIC ANOMALIES OBSERVED IN EITHER RATS OR MICE. AS A RESULT OF GUTHION (AZINPHOS-METHYL) TOXICITY, ONLY 1 LITTER SURVIVED UNTIL WEANING IN RATS. **QC REVIEWED** [SHORT RD ET AL; ARCH TOXICOL 43 (3): 177 (1980)
4. AZINPHOS-METHYL (98.7% PURITY) CAUSED NO INCREASE IN SISTER CHROMATID EXCHANGE FREQUENCIES IN HAMSTER V79 CELLS AT THE DOSES TESTED (2.5, 5.0, 10.0, AND 20.0 UG/ML). **QC REVIEWED** [CHEN HH ET AL; MUTAT RES 103 (3-6): 307-13 (1982)
5. DERMAL LD50 VALUES WERE DETERMINED IN MICE BY APPLICATION OF AZINPHOS METHYL TO HIND FEET. LD50 VALUES WERE HIGHER THAN REPORTED VALUES FOR MICE TREATED ON SHAVED BACK SKIN. CHOLINESTERASE ED50 VALUES ROUGHLY PARALLELED THE LD50 VALUES. **QC REVIEWED** [SKINNER CS, KILGORE WW; J TOXICOL ENVIRON HEALTH 9 (3): 491-97 (1982)
6. The dermal toxicity of 5 organophosphate insecticides was investigated with a mouse intermittent self exposure model. Blood cholinesterases were monitored on days 3 and 1 before exposure and for 4-6 days during exposure to foliar residues. Responses were much greater in unmuzzled than in muzzled animals due to oral contamination. After 2-10 hr exposures, muzzled mice showed log linear cholinesterase responses across a wide range of foliar pesticide concn. Foliar pesticide levels that caused 50% depression in plasma or red blood cell cholinesterase were determined. Azinphos-methyl ... produced no significant responses in muzzled mice at maximal foliar concentrations. **QC REVIEWED** [Skinner CS, Kilgore WW; J Toxicol Environ Health 9 (3): 461-82 (1982)
7. THE RATES OF DISSIPATION OF AZINPHOS FROM THE WATER PHASE OF AQUARIA WITH AND WITHOUT PLANTS AND SEDIMENTS WAS STUDIED. THE MAIN TEST SPECIES WERE DAPHNIA MAGNA, ASELLUS AQUATICUS, CHAOBORUS CRYSTALLINUS, AND CLOEON DIPTERUM. AZINPHOSMETHYL AT 1 MG/CU M REDUCED POPULATIONS OF S VETULUS AND DAPHNIA SPECIES. NO DETRIMENTAL EFFECTS WERE OBSERVED ON CYCLOPOIDA AND OSTRACODA. **QC REVIEWED** [DORTLAND RJ; VERSL LANDBOUWKD ONDERZ 898 (1980)
8. In male mice given a single ip dose of methylazinphos (1 mg/kg) ... the frequency of chromosome aberrations did not increase. **QC REVIEWED** [Degraeve N et al; J Toxicol Clin Exp 6 (1): 5-11 (1986)
9. Male mice (Q strain) /were administered/ two consecutive injections of organophosphorus insecticides: a phosphonate (trichlorfon) was combined to a thiophosphate

(methylparathion) or a dithiophosphate (malathion or methylazinphos) in order to evaluate the interactions at the genetic or cytogenetic levels. No incr in chromosome damage was noted in bone marrow cells, spermatogonia, and primary spermatocytes. In a dominant lethal mutation assay, the frequency of post implantation lethality was not significantly increased over the control level. The percentage of pre-implantation losses was enhanced, probably due to a toxic effect on male germ cells. **QC REVIEWED** [Degraeve N et al; Environ Health Perspect 60: 395-8 (1985)

10. Toxic to bees. **QC REVIEWED** [Farm Chemicals Handbook 1989. Willoughby, OH: Meister Publishing Co., 1989.,p. C-31
11. High and low dose male rats and mice and high dose female rats and mice had lower mean body weights than corresponding matched controls throughout the bioassay. ... Signs of organophosphate intoxication included hyperactivity, tremors, and dyspnea. Sufficient numbers of animals were at risk in each species for development of late appearing tumors. **QC REVIEWED** [DHEW/NCI; Toxicology and Carcinogenesis Studies of Azinphosmethyl p.vii Report# 69 (1978) NIH Pub# 78-1319
12. ... Under the conditions of this bioassay, neoplasms of the thyroid and pancreatic islets suggest but do not provide sufficient evidence for the carcinogenicity of azinphosmethyl in male Osborne Mendel rats. Azinphosmethyl was not shown to be carcinogenic in female Osborne Mendel rats or in B6C3F1 mice of either sex. **QC REVIEWED** [DHEW/NCI; Toxicology and Carcinogenesis Studies of Azinphosmethyl Report# 69 (1978) NIH Pub# 78-1319
13. ... Repetitive injection of fish with guthion caused cumulative inhibition of brain AChE and mortality. **QC REVIEWED** [Benke GM, Murphy SD; Bull Environ Contam Toxicol 12: 117 (1974) as cited in USEPA/OWRS; Quality Criteria for Water 1986 Guthion (1986) EPA 440/5-86-001
14. ... Toxicity values for birds are relatively high and range from 70 to 2,000 mg/kg. **QC REVIEWED** [Tucker RK, Crabtree DG; Handbook of Toxicity of Pesticides to Wildlife. Publ No. 84 (1970) as cited in USEPA/OWRS; Quality Criteria for Water 1986 Guthion (1986) EPA 440/5-86-001
15. ... STIMULATION OF GUTHION-METABOLIZING ENZYME WITH 3-METHYLCHOLANTHRENE INCREASED THE LETHALITY OF GUTHION, WHEREAS INHIBITION OF THIS ENZYME SYSTEM WITH SKF 525-A (BETA-DIETHYL-AMINOETHYLDIPHENYLPROPYLACETATE) DECREASED THE LETHALITY OF THE INSECTICIDE. **PEER REVIEWED** [LaDu, B.N., H.G. Mandel, and E.L. Way. Fundamentals of Drug Metabolism and Disposition. Baltimore: Williams and

Wilkins, 1971. 258

Toxicity Values

Non-Human Toxicity Values:

1. LD50 Guinea pig male oral 80 mg/kg **QC REVIEWED** [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983. 227
2. LD50 Rat oral 13-16.4 mg/kg **QC REVIEWED** [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983. 227
3. LD50 Rat dermal 220 mg/kg **QC REVIEWED** [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983. 227

Ecotoxicity Values:

1. TLm Crassostrea virginica (American oyster) eggs 620 ppb/48 hr in a static lab bioassay **PEER REVIEWED** [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983. 226
2. TLm Mercenaria mercenaria (hard clam) eggs 860 ppb/48 hr in a static lab bioassay **PEER REVIEWED** [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983. 226
3. TLm Mercenaria mercenaria (hard clam) larvae 860 ppb/12 hr in a static lab bioassay **PEER REVIEWED** [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983. 226
4. LC50 Gammarus lacustris 0.15 ug/l/96 hr /Conditions of bioassay not specified/ **PEER REVIEWED** [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983. 226
5. LC50 Gammarus fasciatus 0.10 ug/l/96 hr /Conditions of bioassay not specified/ **PEER REVIEWED** [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983. 226
6. LC50 Palaemonetes kadiakensis 1.2 ug/l/120 hr /Conditions of bioassay not specified/ **QC REVIEWED** [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983. 226
7. LC50 Aselus brevicaudus 21.0 ug/l/96 hr /Conditions of bioassay not specified/ **PEER REVIEWED** [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983. 226
8. LC50 Pteronarcys dorsata 21.1 ug/l/96 hr; 4.9 ug/l/30 day /Conditons of bioassay not specified/ **PEER REVIEWED** [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983. 226
9. LC50 Pteronarcys californica 1.5 ug/l/96 hr /Conditions of

bioassay not specified/ **PEER REVIEWED** [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983. 226

10. LC50 Acroneuria lycorias 1.5 ug/l/30 day /Conditions of bioassay not specified/ **PEER REVIEWED** [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983. 226
11. LC50 Ophiogomphus rupinsulensis 12.0 ug/l/96 hr; 2.2 ug/l/30 day /Conditions of bioassay not specified/ **PEER REVIEWED** [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983. 226
12. LC50 Hydropsyche bettoni 7.4 ug/l/30 day /Conditions of bioassay not specified/ **PEER REVIEWED** [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983. 226
13. LC50 Ephemerella subvaria 4.5 ug/l/30 day /Conditions of bioassay not specified/ **PEER REVIEWED** [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983. 226
14. LC50 Lepomis macrochirus (bluegill sunfish) 5.2 ug/l/96 hr /Conditions of bioassay not specified/ **QC REVIEWED** [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983. 226
15. LC50 Micropterus salmoides (largemouth bass) 5 ug/l/96 hr /Conditions of bioassay not specified/ **QC REVIEWED** [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983. 227
16. LC50 Pimephales promelas (fathead minnow) 93 ug/l/95 hr /Conditions of bioassay not specified/ **QC REVIEWED** [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983. 226
17. LC50 Salmo gairdneri (rainbow trout) 14 ug/l/96 hr /Condtions of bioassay not specified/ **QC REVIEWED** [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983. 227
18. LC50 Salmo trutta (brown trout) 4 ug/l/96 hr /Conditions of bioassay not specified/ **QC REVIEWED** [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983. 227
19. LC50 Oncorhynchus kisutch (coho salmon) 17 ug/l/96 hr /Conditions of bioassay not specified/ **QC REVIEWED** [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983. 227

20. LC50 Perca flavescens (perch) 13 ug/l/96 hr /Conditions of bioassay not specified/ **QC REVIEWED** [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983. 227
21. LC50 Ictalurus punctatus (channel catfish) 3290 ug/l/96 hr /Conditions of bioassay not specified/ **QC REVIEWED** [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983. 227
22. LC50 Ictalurus melas (black bullhead) 3500 ug/l/96 hr /Conditions of bioassay not specified/ **QC REVIEWED** [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983. 227
23. LC50 Carassius auratus (goldfish) 4.3 mg/l/96 hr /Conditions of bioassay not specified/ **QC REVIEWED** [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983. 227
24. LC50 Phoxinus phoxinus (minnow) 0.24 mg/l/96 hr /Conditions of bioassay not specified/ **QC REVIEWED** [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983. 227
25. LC50 Cyprinus carpio (carp) 0.70 mg/l/96 hr /Conditions of bioassay not specified/ **QC REVIEWED** [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983. 227
26. LC50 Lepomis humilis (sunfish) 0.05 mg/l/96 hr /Conditions of bioassay not specified/ **QC REVIEWED** [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983. 227
27. LC50 Lepomis macrochirus (bluegill) 0.02 mg/l/96 hr /Conditions of bioassay not specified/ **QC REVIEWED** [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983. 227
28. TLm Gasterosteus aculeatus (threespine stickleback) 4.8 ppb/96 hr /Conditions of bioassay not specified/ **QC REVIEWED** [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983. 227
29. LC50 Salmo gairdnerii (rainbow trout fingerlings) 7.10 mg/l/96 hr /Conditions of bioassay not specified/ **QC REVIEWED** [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983. 227
30. TLm Pimephales promelas (fathead minnow) 1.9 mg/l/96 hr at 25 deg C in a flow through bioassay **QC REVIEWED**

[Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983. 227

31. TLm Carassius auratus (goldfish) 2.37 mg/l/96 hr at 25 deg C in a flow through bioassay **QC REVIEWED** [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983. 227
32. LC50 Crangon crangon (European shrimp) 0.33 ug/l/48 hr /Conditions of bioassay not specified/ **QC REVIEWED** [Portman J; Fishing News p. 212-17 (1972) as cited in USEPA/OWRS; Quality Criteria for Water 1986 Guthion (1986) EPA 440/5-86-001
33. LC50 Pleuronectes limanda 10-30 ug/l/48 hr /Conditions of bioassay not specified/ **QC REVIEWED** [Portman J; Fishing News p.212-17 (1972) as cited in USEPA/OWRS; Quality Criteria for Water 1986 Guthion (1986) EPA 440/5-86-001
34. LC50 Palaemonetes kadiakensis 0.16 ug/l/20 day /Conditions of bioassay not specified/ **QC REVIEWED** [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983. 226

National Toxicology Program Reports:

1. A bioassay of technical grade azinphosmethyl for possible carcinogenicity was conducted by administering the test chemical in feed to Osborne-Mendel rats and B6C3F1 mice. Groups of 50 rats of each sex were administered azinphosmethyl at one of two doses for 80 wk, then observed for 34 or 35 wk. Time weighted avg doses of either 78 or 156 were used for the males. Initial doses of 62.5 or 125 ppm used for the females were maintained throughout the bioassay. Matched controls consisted of groups of 10 untreated rats of each sex; pooled controls consisted of the matched controls cobined with 95 male and 95 female untreated rats from similar bioassays of 10 other test chemicals. All surviving rats were killed at 114 or 115 wk. ... Under the conditions of this bioassay, neoplasms of the thyroid and pancreatic islets suggest but donot provide sufficient evidence for the carcinogenicity of azinphosmethyl in male Osborne-Mendel rats. Azinphosmethyl was not ... carcinogenic in Female Osborne-Mendel rats or in B6C3F1 mice of either sex. **QC REVIEWED** [DHEW/NCI; Bioassay of Azinphosmethyl for Possible Carcinogenicity p.vii (1978) Technical Rpt Series No. 069 DHEW Pub No. (NIH) 78-1319

Populations at Special Risk:

1. Persons with a history of reduced pulmonary function, convulsive disorders, or recent exposure to anticholinesterase agents would be expected to be at increased risk from exposure. **PEER REVIEWED** [Mackison,

F. W., R. S. Stricoff, and L. J. Partridge, Jr. (eds.).
NIOSH/OSHA - Occupational Health Guidelines for Chemical
Hazards. DHHS(NIOSH) PublicationNo. 81-123 (3 VOLS).
Washington, DC: U.S. Government Printing Office, Jan.
1981. 1

Pharmacokinetics

Absorption, Distribution and Excretion:

1. ANIMAL EXPERIMENTS SHOW THAT THE CMPD IS WELL ABSORBED FROM THE GI TRACT, BUT PERCUTANEOUS ABSORPTION IS MINIMAL. **QC REVIEWED** [Gosselin, R.E., R.P. Smith, H.C. Hodge. Clinical Toxicology of Commercial Products. 5th ed. Baltimore: Williams and Wilkins, 1984.,p. II-297
2. WHEN RADIOACTIVE AZINPHOS-METHYL WAS ADMIN IV TO VOLUNTEER, RADIOACTIVITY EQUIV TO ABOUT 1.5% OF THE ADMIN DOSE PER HR WAS RECOVERED IN THE URINE DURING THE FIRST 12 HR. RECOVERY DECR GRADUALLY BUT WAS STILL SLIGHTLY OVER 0.1% 96-120 HR AFTER INJECTION. THE TOTAL RECOVERY DURING 120 HR WAS 69.5% OF THE DOSE FOLLOWING IV ADMIN AND 15.9% FOLLOWING DERMAL APPLICATION. **PEER REVIEWED** [Hayes, Wayland J., Jr. Pesticides Studied in Man. Baltimore/London: Williams and Wilkins, 1982. 359
3. DIMETHYL THIOPHOSPHATE (DMTP) ONE OF THE PRIMARY METABOLITES OF AZINPHOS-METHYL, WAS MEASURED IN THE URINE OF RATS FOLLOWING DERMAL APPLICATION OF 100, 200, OR 400 MG AZINPHOS-METHYL. THE AMOUNT OF AZINPHOS-METHYL APPLIED CORRELATED WITH URINARY DMTP LEVELS. USING DMTP LEVELS IN URINE FOLLOWING DERMAL AND IM DOSING, THE PERCUTANEOUS ABSORPTION WAS APPROX 60% OF THE APPLIED DOSE. INCREASING THE DOSE FROM 100 TO 400 MG/RAT DID NOT APPRECIABLY AFFECT THIS. **QC REVIEWED** [FRANKLIN CA ET AL; PESTIC CHEM HUM WELFARE ENVIRON, PROC INT CONGR PESTIC CHEM 5TH 4: 221-26 (1983)
4. In vivo percutaneous absorption of guthion in humans is 15.9%. Ventral forearm site of application for 24 hr exposure. /From table/ Effect of occlusion (covering the applied dose) on in vivo percutaneous absorption of guthion is 56.1% dose absorbed. Effect of damaged skin in vivo percutaneous absorption of guthion in humans is 60.5%. **QC REVIEWED** [Wester RC, Maibach HI; J Toxicol Environ Health 16 (1): 25-38 (1985)
5. After 14 days of exposure of bean plants (Phaseolus vulgaris) to (14)Carbon azinophos-methyl ... 15-20% of the label was found in the water fraction and about 35% of this radioactivity was present in two of the more than 10 labeled compounds present. The radioactivity in the organic fractions was primarily (>90%) in the form of the original material. **QC REVIEWED** [Menzie, C.M. Metabolism of Pesticides-Update III. Special Scientific Report- Wildlife No. 232. Washington, DC: U.S.Department

of the Interior, Fish and Wildlife Service, 1980. 46

6. Radiolabeled azinphosmethyl residues are absorbed through the roots and translocated to the shoot of hydroponically treated plants. ... relatively persistent on leaf surfaces ... gradually degraded to polar metabolites. ... **QC REVIEWED** [Purdue University; National Pesticide Information Retrieval System (1988)

Metabolism/Metabolites:

1. USING WHOLE COCKROACH TISSUES & HOMOGENATES OF THESE TISSUES, ENZYMES ... WERE PRESENT THAT WILL ACTIVATE GUTHION & DEGRADE ACTIVE METABOLITE. ... IT IS ASSSUMED THAT GUTHION IS ACTIVATED BY OXIDATION TO CORRESPONDING PHOSPHATES. ... NO METABOLITES ... IDENTIFIED. **QC REVIEWED** [Menzie, C.M. Metabolism of Pesticides. U.S. Department of the Interior, Bureau of Sport Fisheries and Wildlife, Publication 127. Washington, DC: U.S. Government Printing Office, 1969. 44
2. THE METABOLISM OF AZINOPHOSMETHYL BY TWO HEPATIC SYSTEMS WAS STUDIED. BOTH THE OXIDATIVE AND DEMETHYLATING SYSTEMS WERE ACTIVE. THE RATE OF DISAPPEARANCE WAS GREATER IN THE DEMETHYLATING SYSTEM THAN IN THE OXIDATIVE SYSTEM FOR ALL SPECIES EXCEPT THE RAT. THE RATE OF OXIDATIVE SYSTEM DERIVED FROM FEMALE CHICKEN LIVER HOMOGENATE WAS ... LOWER THAN THAT FOR MALE CHICKEN ... WITH SUBCELLULAR MOUSE LIVER FRACTIONS, DEGRADATIVE ACTIVITY WAS ASSOCIATED PRIMARILY WITH MICROSOMAL & SOLUBLE FRACTIONS WHICH REQUIRED NADPH. THE ACTIVITY WAS INHIBITED BY CARBON MONOXIDE. THE SYSTEM CATALYZED HYDROLYSIS WITH FORMATION OF DIMETHYL PHOSPHOROTHIOATE & DIMETHYL PHOSPHATE, & REMOVAL OF AZINPHOSMETHYL SULFUR TO FORM OXYGEN ANALOG. THE ENZYME SYSTEM CATALYZED CONJUGATION OF GLUTATHIONE WITH AZINPHOSMETHYL AND THE FORMATION OF S-METHYL GLUTATHIONE & DESMETHYL AZINOPHOSMETHYL. **QC REVIEWED** [Menzie, C. M. Metabolism of Pesticides, An Update. U.S. Department of the Interior, Fish, Wild-life Service, Special Scientific Report - Wildlife No. 184, Washington, DC: U.S. GovernmentPrinting Office, 1974. 40
3. BOTH IN VIVO & IN VITRO, IN PREDACEOUS MITE NEOSEIULUS (TYPHLODROMUS) FALLACIS, MORE AZINPHOSMETHYL WAS METABOLIZED BY RESISTANT STRAIN THAN BY SUSCEPTIBLE STRAIN. IN VITRO, GLUTATHIONE WAS REQUIRED AS A COFACTOR. THE MAJOR METABOLITE WAS ... DESMETHYL ANALOG. THE OXYGEN ANALOG WAS ALSO OBSERVED. AZINPHOSMETHYL DEGRADATION IN BOTH SUSCEPTIBLE & RESISTANT HOUSEFLIES ... WAS ASSOC WITH MICROSOMAL & SOL FRACTIONS. THE LATTER REQUIRED GLUTATHIONE. THE MIXED FUNCTION OXIDASES APPEARED TO BE IMPORTANT IN OXIDATIVE DESULFURATION & DE-ARYLATION. THE OXYGEN ANALOG ... WAS ALSO DE-METHYLATED. **QC REVIEWED** [Menzie, C. M. Metabolism of Pesticides, An Update. U.S.

Department of the Interior, Fish, Wild-life Service, Special Scientific Report - Wildlife No. 184, Washington, DC: U.S. GovernmentPrinting Office, 1974. 40

4. AZINPHOSMETHYL WAS METABOLIZED BY PSEUDOMONAS FLUORESCENS DSM 1976 TO 3 MAJOR METABOLITES: BIS(BENZAZIMIDYLMETHYL)DISULFIDE WAS FORMED BY HYDROLYSIS OF S-P BOND LEADING TO THIOMETHYLBENZAZIMIDE WHICH WAS ENZYMATICALLY OXIDIZED TO BIS(BENZAZIMIDYLMETHYL). DEGRADATION OF AZINPHOSMETHYL TO BENZAZIMIDE IS BY ENZYMIC OXIDATION. THE FORMATION OF ANTHRANILIC ACID RESULTS FROM CLEAVAGE OF THE HETEROCYCLIC RING. **QC REVIEWED** [ENGELHARDT G ET AL; FEMS MICROBIOL LETT 11 (2-3): 165-69 (1981)
5. DIMETHYL THIOPHOSPHATE, ONE OF THE PRIMARY METABOLITES OF AZINPHOS-METHYL, WAS MEASURED IN THE URINE OF RATS FOLLOWING DERMAL APPLICATION OF 100, 200, OR 400 MG/RAT OF AZINPHOS-METHYL. **QC REVIEWED** [FRANKLIN CA ET AL; PESTIC CHEM HUM WELFARE ENVIRON, PROC INT CONGR PESTIC CHEM 5TH 4: 221-26 (1983)

Mechanism of Action:

1. Cholinesterase inhibition by all routes of exposure. **PEER REVIEWED** [Purdue University; National Pesticide Information Retrieval System (1987)
2. Mode of action is inhibition of the enzyme acetylcholinesterase. **QC REVIEWED** [Sittig, M. (ed.) Pesticide Manufacturing and Toxic Materials Control Encyclopedia. park Ridge, NJ: Noyes Data Corporation. 1980. 70
3. Organophosphorus derivatives act by combining with and inactivating the enzyme acetylcholinesterase (AChE). ... The inactivation of cholinesterase by cholinesterase inhibitor pesticides allows the accumulation of large amounts of acetylcholine, with resultant widespread effects that may be ... separated into 4 categories: (1) Potentiation of postganglionic parasympathetic activity. ... (2) Persistent depolarization of skeletal muscle ... (3) Initial stimulation following depression of cells of central nervous system ... (4) Variable ganglionic stimulation or blockade ... /Cholinesterase inhibitor pesticides/ **QC REVIEWED** [Dreisbach, R.H. Handbook of Poisoning. 12th ed. Norwalk, CT: Appleton and Lange, 1987. 113

Interactions:

1. MIXTURES OF AZINPHOS METHYL WITH SYNTHETIC PYRETHROIDS ARE SYNERGISTIC INSECTICIDES. **QC REVIEWED** [RES DISCL 207: 298-99 (1981)
2. THE IN VITRO EFFECT OF AZINPHOSMETHYL ON THE FUNGICIDAL ACTIVITY OF CAPTAN AND MANCOZEB WAS INVESTIGATED BY A CELLOPHANE TRANSFER TECHNIQUE. THE FUNGISTATIC AND

FUNGICIDAL ACTIVITY OF MANCOZEB WAS REDUCED BY THE ADDITION OF AZINPHOSMETHYL, AS WAS THAT OF CAPTAN. **PEER REVIEWED** [GRADIS WH, SUTTON TB; PLANT DIS 65 (4): 356-8 (1981)

3. IN THE FORWARD MUTATION TEST SYSTEM ADE6 OF THE YEAST SACCHAROMYCES POMBE, TRICHLORFON IN COMBINATION WITH AZINPHOS-METHYL PRODUCED CLEARLY SYNERGISTIC EFFECTS FOR TOXICITY AND MUTAGENICITY. THE ADDITION OF S9 MICROSOMAL LIVER FRACTION DECREASED THE EFFICIENCY OF SINGLE AND COMBINED TREATMENTS. **PEER REVIEWED** [GILOT-DELHALLE J ET AL; MUTAT RES 117 (1-2): 139-48 (1983)

ENVIRONMENTAL FATE/EXPOSURE POTENTIAL

Summary

Environmental Fate/Exposure Summary:

1. Azinphosmethyl is used as a nonsystemic insecticide and acaricide on citrus, cotton, grapes, corn, and some ornamentals, top fruit, and vegetables. Azinphosmethyl released to soil surfaces will probably not be persistent. In one field study, 50% of the azinphosmethyl applied as an emulsion was lost in 12 days. Biodegradation and volatilization are most likely the primary degradation and transport processes, respectively, for azinphosmethyl released to soil surfaces or incorporated in the upper several inches of soil. Azinphosmethyl will be relatively immobile in soil and thus is not expected to leach extensively. Chemical hydrolysis is probably not important except possibly in alkaline soils. If released to water, azinphosmethyl will have a low to medium tendency to sorb to sediments and suspended solids or to bioconcentrate. Volatilization from water is probably not an important transport process since the estimated Henry's Law constant is very low. Biodegradation is probably the most important degradative process for azinphosmethyl in natural waters while chemical hydrolysis is probably not significant except in alkaline waters (half life 28 days in pH 8.6 and 25 deg C). No information was found on photolysis. An estimated half-life for reaction of azinphosmethyl with photochemically generated hydroxyl radicals in the vapor phase of the atmosphere is 6.1 hours. Azinphosmethyl has been found in unspecified fruits and vegetables and in beans. No other monitoring information was available. Exposure to azinphosmethyl may occur through its use as an insecticide and from the consumption of fruits and vegetables that contain it. (SRC) **QC REVIEWED**

Pollution Sources

Artificial Sources:

1. Azinphosmethyl is used extensively as an insecticide, acaricide and moluscicide(1) and therefore shown to be released to the environment during use and some releases

may result from production, formulation and disposal(SRC). **QC REVIEWED** [(1) Purdue Univ; National Pesticide Information Retrieval System (1988)

Environmental Fate

Environmental Fate:

1. AZINPHOS METHYL WAS APPLIED TO SUGARCANE RUNOFF PLOTS AT 0.22 KG/HA, 4 TIMES/YR IN 1980 AND 1981 AS PART OF AN INSECT INTEGRATED PEST MANAGEMENT SYSTEM RESEARCH EVALUATION OF SEASON LONG CONTROL OF THE PRIMARY SUGARCANE INSECT PEST, THE SUGARCANE BORER (DIATRAEA SACCHARALIS). RUNOFF SAMPLES (WATER + SEDIMENT) WERE COLLECTED WITHIN 8 HR AFTER EACH STORM AND ANALYZED BY GAS CHROMATOGRAPHY. IN 1980, RUNOFF LOSSES WERE 0.02% OF THE AMOUNT APPLIED. RUNOFF IN 1981 WAS TWICE THAT IN 1980, PARTIALLY ACCOUNTING FOR LARGER INSECTICIDE RUNOFF LOSSES MEASURED, 0.56% OF THAT APPLIED. THE LARGER 1981 LOSSES ALSO WERE ATTRIBUTED TO SHORTER TIME INTERVALS BETWEEN INSECTICIDE APPLICATIONS AND RUNOFF EVENTS. AZINPHOS METHYL CONCENTRATIONS IN RUNOFF ARE NOT HARMFUL TO SURROUNDING AQUATIC HABITATS. **QC REVIEWED** [SMITH S ET AL; J ENVIRON QUAL 12 (4): 534-37 (1983)
2. TERRESTRIAL FATE: Half-lives (days) for azinphosmethyl in a dry (2-3% moisture content) and wet (50% moisture content) soil were: 484 and 64 (6 deg C), 88 and 13 (25 deg C), and 32 and 5 (40 deg C)(1). When azinphosmethyl was applied as an emulsion to a soil surface in the field, 50% of it was lost in 12 days and when incorporated in granular form into the upper 4-5 inches of the soil, 50% was lost within 28 days(2). In this Wisconsin field study, soil samples collected in May, one year after the insecticide application, contained residue levels of azinphosmethyl that were similiar to those determined in October of the previous year. Although the soil had been rototilled to a depth of 4-5 inches, 90-100% of the total recovered insecticide from a 9 inch deep sample were located in the upper 3 inch soil layer. Two years after azinphosmethyl application, no residues were detected in a 6 inch deep soil sample; however, from 0.01-0.03 ppm were found in the upper 3 inch soil layer(2). In 1980 and 1981, runoff losses were 0.02% and 0.56% of the amount applied respectively(9). Azinphosmethyl will not leach extensively in soils(3,4,5,6). One study estimated that azinphosmethyl will leach < 20 cm per cm of annual rainfall in a loam soil at 25 deg C(3). An estimated Koc for methyl is 638(SRC). Azinphosmethyl will biodegrade in soil(7,8). Chemical hydrolysis is probably not important except in alkaline soils(SRC). **QC REVIEWED** [(1) Yaron B et al; J Agric Food Chem 22: 439-41 (1974) (2) Schulz KR et al; J Econ Entomol 63: 432-8 (1970) (3) Haque R, Freed VH; Res

Rev 52: 89-116 (1974) (4) Helling CS; Soil Sci Soc Amer Proc 35: 737-43 (1971) (5) Kuhr RJ et al; Bull Environ Contam Toxicol 11: 224-30 (1974) (6) Yaron B et al; J Env Qual 3: 413-7 (1974) (7) Engelhardt G et al; J Agric Food Chem 32: 102-8 (1984) (8) Engelhardt G, Wallnoefer PR; Chemosphere 12: 955-60 (1983) (9) Smith S et al; J Environ Qual 12: 534-37 (1983)

3. AQUATIC FATE: Azinphosmethyl released to waters will have a low to medium tendency to sorb to sediments and suspended solids or to bioconcentrate. Volatilization from water is probably no important because of the low Henry's Law constant. The most important removal mechanism for azinphosmethyl in water, based on available soil studies and screening tests, will probably be biodegradation. Studies with aquatic water/sediment microcosms at 5 mg/l and pH 6.7 indicate half-lives of 3.3 days in microcosms compared to 2.7 days in field studies(1). Chemical hydrolysi is probably not important except in alkaline waters. No information was found o photolysis(SRC). **QC REVIEWED** [(1) Portier RJ; in ASTM Spec Techn Publ 865 (Validat Predict Lab Methods Asses Fate Eff Contam Aquat Ecosyst): 14-30 (1985)
4. ATMOSPHERIC FATE: An estimated half-life for vapor phase azinphosmethyl is 1.3 hours due to reaction with hydroxyl radicals(1). **QC REVIEWED** [(1) GEMS; Graphical Exposure Modeling System. Fate of Atmospheric Pollutants (FAP) Data Base. Office of Toxic Substances. USEPA (1986)
5. AQUATIC FATE: ... BEHAVIOR OF AZINPHOS METHYL IN WATER ... ITS HALF LIFE IN BOTH LAB & NATURAL WATER SYSTEMS WAS FOUND TO BE 30-70 DAYS @ PH OF 5.1-8.4. THE HIGHER THE PH, THE LESS PERSISTENT THE CMPD SEEMED TO BE. **QC REVIEWED** [National Research Council. Drinking Water & Health Volume 1. Washington, DC: National Academy Press, 1977. 604
6. TERRESTRIAL FATE: KINETICS OF AZINPHOS METHYL PERSISTENCE IN SOIL WAS STUDIED. LOSSES OF INSECTICIDE FOLLOWED FIRST ORDER KINETICS. ... MOISTURE & TEMP AFFECTED PERSISTENCE OF AZINPHOS METHYL. HALF LIFE VARIED FROM 5 DAYS (40 DEG C AND WET) TO 484 DAYS (6 DEG C WET OR DRY). ... HALF-LIFE 36.4 /DAYS IN WATER/ @ 6 DEG C WITH PH 8.6. **QC REVIEWED** [Menzie, C.M. Metabolism of Pesticides, Update II. U.S. Department of the Interior, Fish Wildlife Service, Special Scientific Report - Wildlife No. 212.Washington, DC: U.S. Government Printing Office, 1978. 25
7. TERRESTRIAL FATE: Field tests with azinphosmethyl indicated that on treated apple trees the half-life of this pesticide was about 2.6 to 6.3 days. **QC REVIEWED** [Menzie, C.M. Metabolism of Pesticides-Update III. Special Scientific Report- Wildlife No. 232. Washington, DC:

U.S.Department of the Interior, Fish and Wildlife Service, 1980. 46

8. Half life ... in a nonsterile soil is 21 days under aerobic condition and 68 days under anaerobic conditions ... in sterile conditions /half life of 355 days/. Under aerobics conditions ... metabolites were ... oxygen analog residues, mercaptomethyl benzazimide, benzazimide, hydroxymethyl benzazimide, and bis-(methyl benzazimide)sulfide. **QC REVIEWED** [Purdue University; National Pesticide Information Retrieval System (1988)

Environmental Transformations

Biodegredation:

1. After 44 and 197 days incubation in a soil, about 50 and 93%, respectively, of the radiolabeled azinphosmethyl was degraded and after 222 days incubation, 18.6% of the radiolabel was recovered as (14)CO2(1). Seventeen metabolites were identified(1). Azinphosmethyl was degraded in batch and continuous culture by mixed cultures of microorganisms that were collected from soil, raw sewage, a trickling filter, activated sludge, and settled sludge(2). Azinphosmethyl concn decreased from 99 mg/l to 49 mg/l after 4 days incubation in a stirred flask containing azinphosmethyl as the sole carbon source and a mixed culture(2). The main degradation products of azinphosmethyl in soil and by selected soil microorganisms are benzazimide, thiomethylbenzazimide, bis-(benzazimidyl-methyl) disulfide, and anthranilic acid(3). **QC REVIEWED** [(1) Engelhardt G et al; J Agric Food Chem 32: 102-8 (1984) (2) Barik S et al; Agric Wastes 10: 81-94 (1984) (3) Engelhardt G, Wallnoefer PR; Chemosphere 12: 955-60 (1983)
2. SOILS WERE TREATED WITH AZINPHOSMETHYL GRANULES. 1 YR LATER, 13% OF THE APPLIED DOSAGE WAS RECOVERED AS AZINPHOSMETHYL, MERCAPTOMETHYL BENZAZIMIDE, N-METHYL BENZAZIMIDE, N-METHYL BENZAZIMIDE SULFIDE OR DISULFIDE, BENZAZIMIDE, & 4 UNIDENTIFIED COMPOUNDS. **PEER REVIEWED** [Menzie, C. M. Metabolism of Pesticides, An Update. U.S. Department of the Interior, Fish, Wild-life Service, Special Scientific Report - Wildlife No. 184, Washington, DC: U.S. GovernmentPrinting Office, 1974. 41

Abiotic Degredation:

1. Hydrolysis half lives for azinphosmethyl in water at pH 8.6 were 36.4, 27.9, and 7.2 days at 6, 25, and 40 deg C, respectively(1). Azinphosmethyl (initial concn 6 ug/ml) half life was 10.4 hours in an ethanol-pH 6.0 buffer solution (20:80) at 70 deg C(2). An estimated atmospheric half-life for azinphosmethyl is 1.3 hours closed upon an estimated reaction with photochemically generated hydroxyl radicals and an average hydroxyl radical concn of 5X10+5

per cu cm(3). Sunlight irradiation of thin films of azinphosmethyl at 30-35 deg C for 25 hrs resulted in a loss of 37% with at least 12 products being formed(4). **QC REVIEWED** [(1) Heuer B et al; Bull Environ Cintam Toxicol 11: 532-7 (1974) (2) Ruzicka JH et al; J Chrom 31: 37-47 (1967) (3) Atkinson R; Internat J Chem Kinetics 19: 799-828 (1987) (4) Chukwudebe A et al; J Agric Food Chem 37: 539-45 (1989)

2. Studies on the photodecomposition of azinphosmethyl have shown that degradation, after an 8 hr exposure of sunlight or ultraviolet light, was greatest on glass surfaces & variable on other surfaces. Surface/non insecticidal water soluble photoproducts formed (%): glass, 18.6%; sandy soil, 6.5%; muck 2.5%; corn leaves 3.5%; and bean leaves 1.4%. **QC REVIEWED** [Menzie, C.M. Metabolism of Pesticides-Update III. Special Scientific Report- Wildlife No. 232. Washington, DC: U.S.Department of the Interior, Fish and Wildlife Service, 1980. 46

3. major degradation products ... from hydrolysis /were benzazimide and hydroxymethylbenzazimide. **QC REVIEWED** [Purdue University; National Pesticide Information Retrieval System (1988)

Environmental Transport

Bioconcentration:

1. Using a measured log octanol/water partition coefficient (log Kow) of 2.75(1) and the recommended regression equation(2), an estimated bioconcentration factor (BCF) for azinphosmethyl is 72(2). This indicates a low potential for biococentration(2). No azinphosmethyl was detected in fish samples taken from a lake after insecticide applications in 1981-83(3). **QC REVIEWED** [(1) Hansch C, Leo AJ; Medchem Project Pomona College Claremont CA Issue No.26 (1985) (2) Lyman WJ et al; Handbook of Chemical Property Estimation Methods. Environmental Behavior of Organic Compounds. McGraw-Hill NY (1982) (3) Bush PB et al; Water Res Bull 22: 817-29 (1986)

Soil Adsorption/Mobility:

1. The estimated adsorption coefficient (Koc) for azinphosmethyl is 404 using a water solubility of 20.9 mg/L (25 deg C)(1) and the recommended regression equation(2). This relatively high Koc indicates that azinphosmethyl will be bound to organic matter in soils and hence will not be very mobile(3,SRC). Experimental data support this prediction. No azinphosmethyl was detected (detection limit was 0.4 ppm) below the top 2 inch soil layer in an apple orchard where 4 applications of azinphosmethyl totaled 3 pounds/acre(4). Azinphosmethyl

was not transported deeply into the soil of an irrigated potato field. Traces were found at a soil depth of 12-30 cnm but none was found below 30 cm(5). In a thin layer chromatography (TLC) experiment, azinphosmethyl was found to have a low mobility in Hagerstown soil (silt clay loam, 1.4% organic content)(6). In another study, soil TLC experiments were conducted using azinphosmethyl and 14 different soils(7); the average Rf value for azinphosmethyl was 0.17. Field moisture capacity (FMC) and organic matter content of a soil were found to be a good predictor of mobility. Increased FMC decreased the soil mobility in the TLC experiments(7). No azinphosmethyl was detected in a soil column effluent after 64 days and batch studies indicate that sorption was not reversible(8). An experimental Koc of 189 (Kom of 110) has been reported(9) but the isotherm was not linear. **QC REVIEWED** [(1) Bowman BT, Sans WW; J Environ Sci Health B18: 221-7 (1983) (2) Lyman WJ et al; Handbook of Chemical Property Estimation Methods. Environmental Behavior of Organic Compounds. McGraw-Hill NY (1982) (3) Kenaga EE; Ecotox Env Safety 4: 26-38 (1980) (4) Kuhr RJ et al; Bull Environ Contam Toxicol 11: 224-30 (1974) (5) Yaron B et al; J Environ Quality 3: 413-7 (1974) (6) Helling CS; Soil Sci Soc Amer Proc 35: 737-43 (1971) (7) Helling CS; Soil Sci Soc Amer Proc 35: 743-8 (1971) (8) Reduker S et al; Bull Environ Contam Toxicol 41: 633-41 (1988) (9) Frobe Z et al; Toxicol Environ Chem 19: 69-82 (1989)

Volatilization from Water/Soil:

1. Using a vapor pressure at 20 deg C of 7.5X10-9 mm Hg(1) and a water solubility of 20.9 mg/l(2), the Henry's Law constant for azinphosmethyl is 1.5X10-10 atm-cu m/mol. This suggests that volatilization of azinphosmethyl from water will not be significant. Volatilization from soil surfaces, however, may be significant(3). In one study, azinphosmethyl was least persistent after field application in an emulsion and when left on the soil surface (50% loss within 12 days after soil treatment) and was most persistent (50% loss within 28 days) after its incorporation in granular form into the upper 4-5 inches of soil(4). **QC REVIEWED** [(1) Worthing CR; The Pesticide Manual 7th ed The British Crop Protection Council Craydon England p 540 (1983) (2) Bowman BT, San WW; J Environ Sci Health B18: 221-7 (1983) (3) Lyman WJ et al; Handbook of Chemical Property Estimation Methods. Environmental Behavior of Organic Compounds. McGraw-Hill NY (1982) (4) Schulz KR et al; J Econom Entomol 63: 432-8 (1970)

Environmental Concentrations

Water Concentrations:

1. SURFACE WATER: Lake Pamvotis, Greece azinphosmethyl concentrations run from no data to 16 ng/l, highest concentrations are found in the summer months near the city of Ioannina(1). Canal concentrations were only detected in June samples ranging from 7-17 ng/l(1). River concentrations were highest during summer months, values ranged from no data to 25 ng/l over a year's time(1). High summer pesticide concentrations are accountable because of a lower volume of water and spring application of pesticides to fields(1). **QC REVIEWED** [(1) Albanis TA et al; Chemosphere 15: 1023-34 (1986)
2. GROUNDWATER: Azinphosmethyl was not detected in farm wells in Canada: 11 wells in 1981 and 1982; 91 wells in 1984(1) and 179 wells in 1986 and 1987(2). **QC REVIEWED** [(1) Frank R et al; Arch Environ Contam Toxicol 16: 1-8 (1987) (2) Frank R et al; Bull Environ Contam Toxicol 44: 410-19 (1990)

Effluents Concentrations:

1. Air emissions of 0.16 kg of sulfur dioxide, 0.13 kg of nitrous oxide, 0.75 kg of hydrocarbons and 0.5 kg of guthion per metric ton of pesticide produced have been reported. **QC REVIEWED** [Sittig, M. (ed.) Pesticide Manufacturing and Toxic Materials Control Encyclopedia. park Ridge, NJ: Noyes Data Corporation. 1980. 70

Sediment/Soil Concentrations:

1. Azinphosmethyl concentration in a surface soil in Alabama was < 0.1 ppm(1). **QC REVIEWED** [(1) Albright R et al; Bull Environ Contam Toxicol 12: 378-84 (1974)

Food Survey Results:

1. Azinphosmethyl has been detected in unspecified fruits and vegetables and in beans(1); however, concentrations were not reported. Azinphosmethyl was detected in 68 of 851 foods and animal feeds analyzed during 1982-86: 12 samples <0.05 ppm; 14 samples 0.05-0.10 ppm; 33 samples 0.10-0.50 ppm; 6 samples 0.5-1.0 ppm; and 3 samples 1.0-2.0 ppm(2). It was also detected in 7 peach samples collected in 1980-82 in Ontario, Canada: 5 below and 2 above 2 mg/kg(3) but was not detected in any of 354 vegetables samples during 1980-85(4). FDA estimates of pesticide intakes in the total diet in 1988 were 0.0013, 0.0039, and 0.0031 ug/kg body wt/day for ages 6-11 months, males 14-16 yr, and females 60-65 yr, respectively(5). **QC REVIEWED** [(1) Duggan RE; Pesticide Residue Levels in Foods in the United States from July 1, 1969 to June 30, 1976; Washington DC: Food and Drug Admin Div Chem Technol (1983) (2) Luke MA; J Assoc Off Anal Chem 7: 415-20 (1988) (3) Frank R et al; Bull Envir Contam Toxicol 39: 277-9 (1987) (4) Frank R et al; J Assoc Off Anal Chem 70: 1081-6 (1987) (5) USFDA; Residues in Food-1988. US Food Drug Admin,

Washington, DC (1989)

Plant Concentrations:

1. Azinphosmethyl has been detected in dehydrated hay at an unspecified concentration(1). **QC REVIEWED** [(1) Duggan RE; Pesticide Residue Levels in Foods in the United States from July 1, 1969 to June 30, 1976; Washington DC: Food and Drug Admin Div Chem Technol (1983)

Human Exposure

Probable Routes of Human Exposure:

1. Very toxic by inhalation, in contact with skin and if swallowed. **QC REVIEWED** [Commission of the European Communities. Legislation on Dangerous Substances - Classification and Labelling in the European Communities. Vol. II. London and Trotman Ltd., 1989.,p. III-577
2. Humans may be exposed to azinphosmethyl during its use as an insecticide and from eating fruits and vegetables that contain it. (SRC) **QC REVIEWED**
3. Human exposure ... from handling, application, and re-entry operations. **PEER REVIEWED** [Purdue University; National Pesticide Information Retrieval System (1987)
4. The average dermal exposure to workers applying azinphosmethyl spray ws 5200 and 4260 ug in Ontario and Nova Scotia, respectively, as determined by patch analysis(1). **QC REVIEWED** [(1) Franklin CA et al; Toxicol Letters 33: 127-36 (1986)

EXPOSURE STANDARDS & REGULATIONS

Standards & Regulations

Immediately Dangerous to Life or Death:

1. 10 mg/cu m **QC REVIEWED** [NIOSH. NIOSH Pocket Guide to Chemical Hazards. DHHS (NIOSH) Publication No. 94-116. Washington, D.C.: U.S. Government Printing Office, June 1994. 22

Acceptable Daily Intake:

1. A Provisional Limiting Dose based on a 2 year dog feeding study has been established using an uncertainty factor of 100. The Maximum Permissible Intake is 0.075 mg/kg for a 60 kg person. The Theoretical Maximum Residue Contribution to the human diet from the existing tolerances is 0.6678 mg for a 1.5 kg diet which is 899% of the Maximum Permissible Intake (This value is greatly inflated when compared to actual dietary residues expected in practice, and is due solely to the additional ten fold uncertainty factor applied for the reduced data base and two fold increase in sensitivity of the dog compared to that of the rat). When the required chronic feeding studies are submitted, the Provisional Limiting Dose and Theoretical Maximum Residue Contribution will be re-evaluated. **QC REVIEWED** [Purdue University; National Pesticide Information Retrieval System (1987)

2. FAO/WHO ADI: 0.005 mg/kg bw **QC REVIEWED** [FAO/WHO; Pesticide Residues in Food - 1991. Joint Meeting of the FAO Panel of Experts on Pesticide Residues in Food and the Environment and the WHO Expert Group on Pesticide Residues. Geneva, September 16-22, 1991. Evaluations Part 1 - Residues. p.629 FAO Plant & Prod Protect Paper 113/1 (1992)

Allowable Tolerances:

1. A tolerance of 0.04 part per million (negligible residue) is established for residues of O,O-dimethyl S-(4-oxo-1,2,3-benzotriazin-3 (4H)-yl)methyl) phosphorodithiate and/or its metabolites calculated as O,O-dimethyl S-(4-oxo-1,2,3-benzotriazin-3 (4H)-yl-methyl) phosphorodithioate in milk. **QC REVIEWED** [40 CFR 180.154(a) (7/1/88)
2. Tolerances for residues of the insecticide O,O-dimethyl S-((4-oxo-1,2,3-benzotriazin-3-(4H)-yl) methyl) phosphorodithioate in or on the following raw agricultural commodities (in ppm) are as follows: Alfalfa, apples, apricots, artichokes, barley (straw), beans (snap), blackberries, boysenberries, broccoli, brussels sprouts, cabbage, cauliflower, celery, cherries, citrus fruits, clover, crabapples, cranberries, cucumbers, pasture grass (green), loganberries, melons (honeydew, muskmelons, cantaloups, watermelons, and other melons), nectarines, oats (grain, straw), onions, peaches, pears, plums (fresh prunes), quinces, raspberries, rye (straw), spinach, strawberries, tomatoes (pre and post harvest), wheat (straw): 2.0 ppm; Alfalfa (hay), bluberries, clover, (hay), gooseberries, grapes, pasture grass (hay): 5.0 ppm; Almonds, beans (dry), eggplants, fiiberts, nuts, pistachio, peas (black-eyed), pecans, peppers, potatoes, sugarcane, walnuts: 0.3 ppm; Barley (grain), rye (grain), soybeans, wheat (grain): 0.2 ppm; Birdsfood (filberts), parsley (roots): 2 ppm; Birdfood (trefoil hay), parsley (leaves): 5 ppm; Cattle (fat), cattle (meat by-products), cattle (meat), goats (fat), goats (meat by-products), goats (meat), horses (fat), horses (meat by-products), horses (meat), sheep (fat), sheep (meat by-products), sheep (meat): 0.1 ppm; Cottonseed: 0.5 ppm; Kiwi fruit: 10.0 ppm: Potatoes: 0.3 ppm. **PEER REVIEWED** [40 CFR 180.154 (7/1/88)
3. The following tolerances are established for residues of the insecticide O,O-dimethyl S-(4-oxo-1,2,3-benzotriazin-3(4H)-ylmethyl) phosphorodithioate in the indicated commodities when used for the feed of cattle, goats, and sheep: 5 ppm in dried citrus pulp. 1.5 ppm in sugarcane. Such residues may be present therein only as a result of the application of the

insecticide to the growing agricultural crop. **QC REVIEWED** [21 CFR 561.180 (4/1/88)

4. Classified for restricted use, limited to use by or under the direct supervision of a certified applicator. All liquids with a concn greater than 13.5 pct for all uses are restricted due to an inhalation hazard to humans. **QC REVIEWED** [40 CFR 152.175 (7/1/88)

5. The data for azinphosmethyl residues in or on potatoes (0.3 ppm), parsley (5.0 ppm leaves; 2.0 ppm, roots), pistachios (0.3 ppm, mnt), sugarcane bagasse and sugarcane (0.3 ppm) are adequate to support the respective established tolerances. **QC REVIEWED** [Purdue University; National Pesticide Information Retrieval System (1988)

Occupational Permissible Levels

OSHA Standards:

1. Meets criteria for OSHA medical records rule. **QC REVIEWED** [29 CFR 1910.20 (7/1/88)

2. 8 hr Time-Weighted avg: 0.2 mg/cu m /Skin/ **QC REVIEWED** [29 CFR 1910.1000 (7/1/88)

NIOSH Recommendations:

1. 10 hr Time-Weighted avg: 0.2 mg/cu m [skin]. **QC REVIEWED** [NIOSH. NIOSH Pocket Guide to Chemical Hazards. DHHS (NIOSH) Publication No. 94-116. Washington, D.C.: U.S. Government Printing Office, June 1994. 22

Threshold Limit Values:

1. 8 hr Time Weighted Avg (TWA) 0.2 mg/cu m, Skin (1986) **QC REVIEWED** [American Conference of Governmental Industrial Hygienists. Threshold Limit Values (TLVs) for Chemical Substances and Physical Agents and BiologicalExposure Indices (BEIs) for 1995-1996. Cincinnati, OH: ACGIH, 1995. 13

2. Excursion Limit Recommendation: Excursions in worker exposure levels may exceed three times the TLV-TWA for no more than a total of 30 min during a work day, and under no circumstances should they exceed five times the TLV-TWA, provided that the TLV-TWA is not exceeded. **QC REVIEWED** [American Conference of Governmental Industrial Hygienists. Threshold Limit Values (TLVs) for Chemical Substances and Physical Agents and BiologicalExposure Indices (BEIs) for 1995-1996. Cincinnati, OH: ACGIH, 1995. 5

3. BEI (Biological Exposure Index): Cholinesterase activity in red cells (timing is discretionary) is 70% of individual's baseline. The determinant is usually present in a significant amt in biological specimens collected from subjects who have not been occupationally exposed. Such background levels are incl in the BEI value. The determinant is nonspecific, since it is observed after

exposure to some other chemicals. These nonspecific tests are preferred because they are easy to use and usually offer a better correlation with exposure than specific tests. In such instances, a BEI for a specific, less quantitative biological determinant is recommended as a confirmatory test. The biological determinant is an indicator of exposure to the chemical, but the quantitative interpretation of the measurements is ambiguous. (1989-90 adoption) /Organophosphorus cholinesterase inhibitors/ **QC REVIEWED** [American Conference of Governmental Industrial Hygienists. Threshold Limit Values (TLVs) for Chemical Substances and Physical Agents and BiologicalExposure Indices (BEIs) for 1995-1996. Cincinnati, OH: ACGIH, 1995. 65

Other Standards and Regulations

CERCLA Reportable Quantities:

1. Persons in charge of vessels or facilities are required to notify the National Response Center (NRC) immediately, when there is a release of this designated hazardous substance, in an amount equal to or greater than its reportable quantity of 1 lb or 0.454 kg. The toll free number of the NRC is (800) 424-8802; In the Washington D.C. metropolitan area (202) 426-2675. The rule for determining when notification is required is stated in 40 CFR 302.4 (section IV. D.3.b). **QC REVIEWED** [40 CFR 302.4 (7/1/88)

State Drinking Water Guidelines

1. (ME) MAINE 25 ug/l [USEPA/Office of Water; Federal-State Toxicology and Risk Analysis Committee (FSTRAC). Summary of State and Federal Drinking Water Standards and Guidelines (11/93)

Clean Water Act Requirements

1. Designated as a hazardous substance under section 311(b)(2)(A) of the Federal Water Pollution Control Act and further regulated by the Clean Water Act Amendments of 1977 and 1978. These regulations apply to discharges of this substance. [40 CFR 116.4 (7/1/88)

FIFRA Requirements:

1. All liquid formulations with concentrations of 13.5% or greater are currently classified as restricted use chemicals. **PEER REVIEWED** [Purdue University; National Pesticide Information Retrieval System (1987)
2. The Agency is requiring extensive field monitoring data to define better the extent of exposure and hazard to wildlife. No new tolerances or new food uses will be considered until the Agency has received data sufficient to assess existing tolerances for azinphos-methyl. The Agency is concerned about the potential for human poisonings (cholinesterase inhibition) from the use of

azinphos-methyl. The Agency will continue to restrict all liquid formulations of azinphos-methyl with greater than 13.5% active ingredient. In addition, registrants must either classify all products for restricted use (due to acute toxicity) or submit dermal and inhalation data to support the appropriate toxicity category. Revised Protective clothing statements are required to be included on the labels of azinphos-methyl end use products. The Agency has concluded that data are not adequate to determine the oncogenic potential of azinphos-methyl and is requiring numerous toxicology studies mentioned below. The Agency is requiring that endangered species labeling be added to labels for certain azinphos-methyl uses. A 24 hour re-entry interval, previously established under 40 CFR 170.3(b) (2) will remain in effect. The Agency is imposing an interim rotational crop restriction of 6 months for root crops and 30 days for all other registered crops until the required crop rotation data are submitted. **PEER REVIEWED** [Purdue University; National Pesticide Information Retrieval System (1987)

3. Additional crop residue studies on various commodities and plant and animal metabolism studies are required to support existing tolerances. The following studies are required to assess the toxicological characteristics of technical azinphos-methyl: Acute inhalation, delayed neurotoxicity, oncogenicity/chronic testing in rat, teratology, reproduction, mutagenicity, and general metabolism. The following data are required to fully characterize azinphos-methyl's environmental fate: Re-entry data (foliar dissipation, soil dissipation, dermal exposure, inhalation exposure). Special testing: Glove permeability, photodegradation, anaerobic aquatic (Data not needed if label clarifications are made), forestry dissipation (Data not needed if label clarifications are made), rotational crops (confined), irrigated crops accumulated study (Data not needed if label clarifications are made), accumulation in non target organisms (Data not needed if label clarifications are made). Additional data are required to assess the impact on wildlife from the use of azinphos-methyl: Acute avian oral toxicity, ... wild mammal estuarine ... and marine organisms, fish early life stage, simulated or actual field testing for aquatic organisms and honey bee toxicity. Product chemistry and acute toxicity data are required. **QC REVIEWED** [Purdue University; National Pesticide Information Retrieval System (1987)

4. A tolerance of 0.04 part per million (negligible residue) is established for residues of O,O-dimethyl S-(4-oxo-1,2,3-benzotriazin-3 (4H)-yl)methyl)

phosphorodithioate and/or its metabolites calculated a O,O-dimethyl S-(4-oxo-1,2,3-benzotriazin-3 (4H)-yl-methyl) phosphorodithioate in milk. **QC REVIEWED**. [40 CFR 180.154(a) (7/1/88)

5. Tolerances for residues of the insecticide O,O-dimethyl S-((4-oxo-1,2,3-benzotriazin-3-(4H)-yl) methyl) phosphorodithioate in or on the following raw agricultural commodities are as follows: Alfalfa, apples, apricots, artichokes, barley (straw), beans (snap), blackberries, boysenberries, broccoli, brussels sprouts, cabbage, cauliflower, celery, cherries, citrus fruits, clover, crabapples, cranberries, cucumbers, pasture grass (green), loganberries, melons (honeydew, muskmelons, cantaloups, watermelons, and other melons), nectarines, oats (grain, straw), onions, peaches, pears, plums (fresh prunes), quinces, raspberries, rye (straw), spinach, strawberries, tomatoes (pre- and post-H), wheat (straw), alfalfa (hay), bluberries, clover, (hay), gooseberries, grapes, pasture grass (hay), almonds, beans (dry), eggplants, fiiberts, nuts, pistachio, peas (black eyed), pecans, peppers, potatoes, sugarcane, walnuts, barley (grain), rye (grain), soybeans, wheat (grain), birdsfoot (filberts), parsley (roots), birdsfoot (filberts hay), parsley (leaves), cattle (fat), cattle (meat by-products), cattle (meat), goats (fat), goats (meat by-products), goats (meat), horses (fat), horses (meat by-products), horses (meat), sheep (fat), sheep (meat by-products) sheep (meat), cottonseed, kiwi fruit, potatoes. **PEER REVIEWED** [40 CFR 180.154 (7/1/88)
6. Tolerances are established for residues of the insecticide O,O-dimethyl S-(4-oxo-1,2,3-benzotriazin-3(4H)-ylmethyl) phosphorodithioate in the indicated commodities when used for the feed of cattle, goats, and sheep, dried citrus pulp, and sugarcane. Such residues may be present therein only as a result of the application of the insecticide to the growing agricultural crop. **QC REVIEWED** [21 CFR 561.180 (4/1/88)
7. Classified for restricted use, limited to use by or under the direct supervision of a certified applicator. All liquids with a concn greater than 13.5% for all uses are restricted due to an inhalation hazard to humans. **QC REVIEWED** [40 CFR 152.175 (7/1/88)

FDA Requirements:

1. Tolerances are established for residues of the insecticide O,O-dimethyl S-(4-oxo-1,2,3-benzotriazin-3(4H)-ylmethyl) phosphorodithioate in the indicated commodities when used for the feed of cattle, goats, and sheep: dried citrus pulp, and sugarcane. Such residues may be present therein only as a result of the application of the insecticide to

the growing agricultural crop. **QC REVIEWED** [21 CFR 561.180 (4/1/88)

MONITORING AND ANALYSIS METHODS

Sampling Procedures:

1. Measurements to determine employee exposure are best taken so that the average eight hour exposure is based on a single eight hour sample or on two four hour samples. Several short time interval samples (up to 30 minutes) may also be used to determine the average exposure level. Air samples should be taken in the employee's breathing zone (air that would most nearly represent that inhaled by the employee). **QC REVIEWED** [Mackison, F. W., R. S. Stricoff, and L. J. Partridge, Jr. (eds.). NIOSH/OSHA - Occupational Health Guidelines for Chemical Hazards. DHHS(NIOSH) PublicationNo. 81-123 (3 VOLS). Washington, DC: U.S. Government Printing Office, Jan. 1981. 2

Analytic Laboratory Methods:

1. SOME PROCEDURES FOR THE ENZYMATIC DETECTION OF ORGANOPHOSPHORUS PESTICIDES, WHICH HAVE GIVEN REPRODUCIBLE RESULTS ON A ROUTINE SCALE, ARE DESCRIBED. THE METHODS HAVE SUCCESSFULLY BEEN APPLIED TO THE DETECTION OF AZINOPHOSMETHYL IN FRUIT OR VEGETABLE EXTRACTS. THE METHODS INVOLVE INITIAL THIN-LAYER CHROMATOGRAPHY OF THE SAMPLE EXTRACTS, THEN OXIDATION WITH BROMINE TO CONVERT THE THIOPHOSPHATES TO ACTIVE ENZYME INHIBITORS. THE PLATES ARE THEN SPRAYED WITH ESTERASES FROM A SUITABLE SOURCE & FURTHER SPRAYED WITH A SUITABLE SUBSTRATE WHICH WILL CAUSE THE BACKGROUND TO BECOME COLORED FOLLOWING HYDROLYSIS. ALTERNATIVELY, THE ENZYME & AN ACID-BASE INDICATOR ARE INCORPORATED INTO AN AGAR GEL & THE DEVELOPED TLC PLATE PRESSED AGAINST THIS FOR 1 HR AFTER ACTIVATION WITH BROMINE, THEN THE AGAR IS SPRAYED WITH ACETYLCHOLINE, WHICH RELEASES ACETIC ACID ON HYDROLYSIS. THE LIMIT OF DETECTION ACHIEVED FOR MOST SUBSTANCES IS 1 TO 10 NG. THE METHOD CAN BE USED AS A SCREENING PROCEDURE FOR ROUTINE ANALYSES. **QC REVIEWED** [STIJVE T JR, CARDINALE E JR; MITT GEB LEBENSMITTELUNTERS HYG 62 (1): 25-31 (1971)
2. PRODUCT ANALYSIS IS BY COLORIMETRIC MEASUREMENT OF THE PHOSPHORODITHIOATE MOIETY AS A COMPLEX , CIPAC HANDBOOK, 1970, 1, 25; FAO SPECIFICATION (CP/4). RESIDUE ANALYSIS IS BY GLC, ANALYST (LONDON), 1977, 102, 858. **QC REVIEWED** [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987. 42
3. GUTHION IS EXTRACTED FROM CROP WITH ACETONE & REEXTRACTED WITH CHLOROFORM FROM ACETONE DIL WITH WATER, SOLVENT IS REMOVED BY EVAPORATION; RESIDUE IS DISSOLVED IN ISOPROPANOL & CLEANED UP ON CHROMATOGRAPHY COLUMN. **QC REVIEWED** [Association of Official Analytical Chemists.

Official Methods of Analysis. 10th ed. and supplements. Washington, DC: Association of Official Analytical Chemists, 1965. New editions through13th ed. plus supplements, 1982.,p. 13/488 29.107

4. COMPARISON OF HIGH PERFORMANCE LIQUID CHROMATOGRAPHY AND ANTICHOLINESTERASE ASSAY FOR MEASURING AZINPHOS-METHYL METABOLISM IN VITRO IS DISCUSSED. AZINPHOS-METHYL OXON WAS NOT THERMALLY STABLE. UNDER GAS CHROMATOGRAPHIC CONDITIONS, ON-COLUMN DECOMPOSITION OCCURRED AND TENDED TO PRODUCE COMPONENTS WHICH UPON ELECTRON IMPACT GENERATED THE SAME IONS AS THOSE GENERALLY EMPLOYED TO IDENTIFY THE METABOLITES OF AZINPHOS-METHYL BY MASS SPECTROMETRY. INVESTIGATION OF THE INTERCHANGEABILITY BETWEEN HPLC (HIGH PERFORMANCE LIQUID CHROMATOGRAPHY) AND THE ANTICHOLINESTERASE (ACHE) ASSAY WAS CARRIED OUT BY QUANTITATING THE OXON OF AZINPHOS-METHYL IN THE SAME BIOLOGICAL SAMPLES. BOTH METHODS SELECTIVELY MEASURED THE COMPOUND TO THE SAME DEGREE OF ACCURACY. WHEREAS THE ACHE ASSAY APPEARED TO BE FASTER, HIGH PERFORMANCE LIQUID CHROMATOGRAPHY WAS ADVANTAGEOUS IN THAT SEVERAL METABOLITES OF AZINPHOS-METHYL COULD BE SIMULTANEOUSLY ASSAYED. **QC REVIEWED** [LIN SN ET AL; J AGRIC FOOD CHEM 31 (4): 756-59 (1983)

5. Azinphos-methyl in pesticide formulations is analyzed using an IR spectrophotometer scanning over 600-700 cm. Calculation is based on peak response versus a standard reference. This method is applicable to 50% wettable powders and 2 lb/gal liquid concentration where azinphos-methyl is the only active ingredient. **QC REVIEWED** [Association of Official Analytical Chemists. Official Methods of Analysis. 10th ed. and supplements. Washington, DC: Association of Official Analytical Chemists, 1965. New editions through13th ed. plus supplements, 1982.,p. 14/125 6.406

6. EPA Method 8140: Organophosphorus Pesticides. Method 8140 is a gas chromatographic method used to determine the concentration of various organophosphorous pesticides. Prior to analysis, appropriate sample extraction techniques must be used. ... Organic liquids may be analyzed by direct injection. A 2 to 5 ul aliquot of the extract is injected into a gas chromatograph, and compounds in the gas chromatographic effluent are detected with a flame photometer or thermionic detector. Azinphosmethyl has a method detection limit of 1.5 ug/l with a retention time of 6.80 min. Single operator accuracy and precision of 17 analyses results in an average recovery of 72.7%, and a standard deviation of 18.8%. **QC REVIEWED** [USEPA; Test Methods for Evaluating Solid Waste SW-846 (1986)

7. EPA Method 8141 is a gas chromatographic method used to determine azinphosmethyl in ground water, soil, and non-water miscible waste. A gas chromatograph with a flame photometric or nitrogen-phosphorus detector is used for this multiresidue procedure. Method detection limits for this compound using a flame photometric detector are 0.10 ug/l for water, and 5.0 ug/kg for soil. M8141 **QC REVIEWED** [USEPA; Test Methods for Evaluating Solid Waste SW-846 (1986)

Clinical Laboratory Methods:

1. /Azinphos-methyl in blood, urine, stomach content, and tissue is determined using thin layer chromatography./ ... esters extracted with pentane. These extracts are concentrated and aliquots are chromatographed on alumina plates. After the plates are developed, the spray reaction for identification is based on the release of naphthol from 2-naphthylacetate by human esterase. This reacts with Echtblausalz B to form a colored complex. The inhibiting pesticide shows up on the chromatogram as white spots on a rose-violet background. Rf value using a pentane/acetone/toluene solvent system is 40 (X100), 83 (X100) in a pentane/acetone/toluene/ethyl acetate system. Sensitivity: detection limit for gunthion is 20-50 ng. /Additional method/: Azinphos-methyl in blood is analyzed using GC with halogen phosphorus detection. The samples are extracted with pentane and filtered. An 80% recovery can be obtained. **QC REVIEWED** [Sunshine, Irving (ed.) Methodology for Analytical Toxicology. Cleveland: CRC Press, Inc., 1975. 288

ADMINISTRATIVE INFORMATION
Hazardous Substance DataBank Number:
1. 1736
Last Revision Date:
1. 961015
Review Date:
1. Reviewed by SRP on 03/16/90
Update History:
1. Complete Update on 10/15/96, 1 field added/edited/deleted.
2. Complete Update on 09/04/96, 6 fields added/edited/deleted.
3. Complete Update on 06/03/96, 1 field added/edited/deleted.
4. Complete Update on 05/10/96, 1 field added/edited/deleted.
5. Complete Update on 01/21/96, 1 field added/edited/deleted.
6. Complete Update on 04/20/95, 1 field added/edited/deleted.
7. Complete Update on 04/20/95, 1 field added/edited/deleted.
8. Complete Update on 01/23/95, 1 field added/edited/deleted.
9. Complete Update on 12/28/94, 1 field added/edited/deleted.
10. Complete Update on 11/28/94, 1 field added/edited/deleted.
11. Complete Update on 07/28/94, 1 field added/edited/deleted.
12. Complete Update on 03/25/94, 1 field added/edited/deleted.
13. Complete Update on 08/07/93, 1 field added/edited/deleted.
14. Field update on 12/21/92, 1 field added/edited/deleted.
15. Complete Update on 01/23/92, 1 field added/edited/deleted.
16. Complete Update on 01/07/91, 60 fields added/edited/deleted.
17. Field Update on 03/07/90, 1 field added/edited/deleted.
18. Field Update on 03/06/90, 1 field added/edited/deleted.
19. Field Update on 01/15/90, 1 field added/edited/deleted.
20. Complete Update on 01/11/90, 55 fields added/edited/deleted.
21. Express Update on 10/13/89, 2 fields added/edited/deleted.
22. Field Update on 02/10/89, 1 field added/edited/deleted.
23. Complete Update on 09/21/88, 66 fields added/edited/deleted.
24. Complete Update on 03/31/86

SUBSTANCE IDENTIFICATION
Name of Substance:
1. METHOMYL
CAS Registry Number:
1. 16752-77-5
Synonyms:
1. 1-(METHYLTHIO)ACETALDEHYDE O-METHYLCARBAMOYLOXIME **PEER REVIEWED** [Martin, H. and C.R. Worthing (eds.). Pesticide Manual. 4th ed. Worcestershire, England: British Crop Protection Council, 1974. 343
2. 1-(METHYLTHIO)ETHYLIDENEAMINO METHYLCARBAMATE **PEER REVIEWED** [Martin, H. and C.R. Worthing (eds.). Pesticide Manual. 4th ed. Worcestershire, England: British Crop Protection Council, 1974. 343
3. 3-THIABUTAN-2-ONE, O-(METHYLCARBAMOYL)OXIME **PEER REVIEWED**
4. ACETIMIDOTHIOIC ACID, METHYL-, N-(METHYLCARBAMOYL) ESTER **PEER REVIEWED**

5. ETHANIMIDOTHIOIC ACID, N-(((METHYLAMINO)CARBONYL)OXY)-, METHYL ESTER **PEER REVIEWED**
6. METHYL N-((METHYLAMINO)CARBONYL)OXY)ETHANIMIDO)THIOATE **PEER REVIEWED**
7. METHYL N-((METHYLCARBAMOYL)OXY)THIOACETIMIDATE **PEER REVIEWED**
8. METHYL O-(METHYLCARBAMOYL)THIOLACETOHYDROXAMATE **PEER REVIEWED**
9. METHYL O-(METHYLCARBAMYL)THIOLACETOHYDROXAMATE **PEER REVIEWED**
10. N-((METHYLCARBAMOYL)OXY)THIOACETIMIDIC ACID METHYL ESTER **PEER REVIEWED**
11. N-(((METHYLAMINO)CARBONYL)OXY)ETHANIMIDOTHIOIC ACID METHYL ESTER **PEER REVIEWED**
12. S-METHYL N-(METHYLCARBAMOYLOXY)THIOACETIMIDATE **PEER REVIEWED**
13. Ent 27,341 **PEER REVIEWED**
14. 2-Methylthio-acetaldehyd-O-(methylcarbamoyl)-oxim (German) **PEER REVIEWED**
15. 2-Methylthio-propionaldehyd-O-(methylcarbamoyl)oxim (German) **PEER REVIEWED**
16. DUPONT 1179 **PEER REVIEWED**
17. INSECTICIDE 1,179 **PEER REVIEWED**
18. SD 14999 **PEER REVIEWED**
19. DU PONT INSECTICIDE 1179 **PEER REVIEWED**
20. Lanox 90 **PEER REVIEWED** [Farm Chemicals Handbook 1986. Willoughby, Ohio: Meister Publishing Co., 1986.,p. C-153
21. Lanox 216 **PEER REVIEWED** [Farm Chemicals Handbook 1986. Willoughby, Ohio: Meister Publishing Co., 1986.,p. C-153
22. MESOMILE **PEER REVIEWED**
23. WL 18236 **PEER REVIEWED**
24. Metomil (Italian) **PEER REVIEWED**
25. LANNATE **PEER REVIEWED**

Molecular Formula:
1. C5-H10-N2-O2-S **PEER REVIEWED** [The Merck Index. 10th ed. Rahway, New Jersey: Merck Co., Inc., 1983. 859

RTECS Number:
1. NIOSH/AK2975000

OHM-TADS Number:
1. 8100100

Shipping Name/Number - DOT/UN/NA/IMCO:
1. IMO 6.1; Carbamate pesticides, solid, toxic, nos; carbamate pesticides, liquid, toxic, flammable, nos, flashpoint between 23 deg C and 61 deg C; carbamate pesticides, liquid, toxic, nos; carbamate pesticides, liquid, nos
2. IMO 3.2; Carbamate pesticides, liquid, flammable, toxic, nos, flashpoint less than 23 deg C
3. UN 2757; Carbamate pesticides, solid, toxic, nos; carbamate pesticides, liquid, nos
4. UN 2758; Carbamate pesticides, liquid, flammable, toxic, nos, flashpoint less than 23 deg C
5. UN 2991; Carbamate pesticides, liquid, toxic, flammable, nso, flashpoint between 23 deg C and 61 deg C

6. UN 2992; Carbamate pesticides, liquid, toxic, nos

STCC Number:

1. 49 105 28; Carbamate pesticide (compounds and preparations), liquid (flammable liquid)
2. 49 216 25; Carbamate pesticide (compounds and preparations), liquid (poison B) (insecticides, agricultural, nos, liquid)
3. 49 216 27; Carbamate pesticide (compounds and preparations), solid (poison B) (insecticides, agricultural, nec, other than liquid)
4. 49 105 27; Carbamate pesticide (compounds and preparations), liquid (flammable liquid)
5. 49 216 24; Carbamate pesticide (compounds and preparations), liquid (poison B) (insecticides, nec, other than agricultural)
6. 49 216 26; Carbamate pesticide (compounds and preparations), solid (poison b) (insecticides, nec, other than agricultural)

EPA Hazardous Waste Number:

1. P066; An acute hazardous waste when a discarded commercial chemical product or manufacturing chemical intermediate or an off-specification commercial chemical product or a manufacturing chemical intermediate.

MANUFACTURE/USE INFORMATION

Methods of Manufacturing:

1. REACTION OF METHYL THIOMETHYL OXIME & METHYL ISOCYANATE **PEER REVIEWED** [SRI

Formulations/Preparations:

1. Lannate, SP (900 g ai/kg); Lannate L, SL (220 g/l). Mixtures include: Flytek (Zoecon), RB (10 g methomyl + 0.25 g (Z)-tricos-9-ene); methomyl + fenson. **PEER REVIEWED** [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987. 550
2. Liquid (1.8 lb ai/gal), low volatility liquid formulation (2.4 lb ai/gal), Lannate LV), 90% water-soluble powder. **PEER REVIEWED** [Farm Chemicals Handbook 1989. Willoughby, OH: Meister Publishing Co., 1989.,p. C-191
3. "Lannate" LV Insecticide (29% methomyl contains methanol). **PEER REVIEWED** [Gosselin, R.E., R.P. Smith, H.C. Hodge. Clinical Toxicology of Commercial Products. 5th ed. Baltimore: Williams and Wilkins, 1984.,p. V-358
4. Methomyl is a mixture of (Z)- and (E)- isomers (the former predominating) **PEER REVIEWED** [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987. 550

Manufacturers:

1. E I du Pont de Nemours and Company, Inc, Hq, 1007 Market Street, Wilmington, DE 19898, (302) 774-1000; Agrichemicals Department; Production site: Laporte, TX 77571 **UNREVIEWED** [SRI. 1989 Directory of Chemical Producers - United States of America. Menlo Park, CA: SRI International, 1989. 837

Other Manufacturing Information:

1. IT WAS INTRODUCED, IN 1966, AS EXPTL INSECTICIDE-NEMATOCIDE BY EI DU PONT DE NEMOURS & CO ... UNDER CODE NUMBER "DU PONT 1179, TRADE MARK 'LANNATE' &

PROTECTED BY US PATENT 3576834 & 3639633. ... FOLLOWING SOIL TREATMENT IT IS TAKEN UP BY ROOTS & TRANSLOCATED ... THIS METHOD IS GENERALLY LESS EFFECTIVE THAN FOLIAR TREATMENT. **PEER REVIEWED** [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987. 550

2. Nu-Bait III, produced by Griffin Corp, has been discontinued **PEER REVIEWED** [Farm Chemicals Handbook 1986. Willoughby, Ohio: Meister Publishing Co., 1986.,p. C-153

3. An insecticide microcapsule consisting essentially of a core of methomyl surrounded by a cover of non-crosslinked, all aromatic polyurea. The polyurea is formed by dispersing a solution of methylene chloride, methomyl, and toluene-2,4-diisocyanate of at least 95% purity in aqueous medium creating a dispersion of liquid microspheres. The ratio of toluene-2,4-diisocyanate to methomyl is 1:4 to 3:1 by weight and the ratio of methylene chloride to methomyl is about 2:1 to 3:1 by weight. Hardening the liquid microspheres is achieved by adding an aqueous alkali to the dispersion with the ratio of aqueous alkali to toluene-2,4-diisocyanate being about 0.25:2 to 2:1 on a molar basis and removing the methylene chloride. **PEER REVIEWED** [Tocker S; Microencapsulated Methomyl Insecticide. US Patent Office Gazette 1000 (4): 1571 Patent No. 4,235,875 (1980) Assigned to EI DuPont de Nemours & Co

Major Uses:

1. NEMATOCIDE **PEER REVIEWED** [Gosselin, R.E., R.P. Smith, H.C. Hodge. Clinical Toxicology of Commercial Products. 5th ed. Baltimore: Williams and Wilkins, 1984.,p. II-307

2. INSECTICIDE ON VEGETABLES, TOBACCO, COTTON, ALFALFA, SOYBEANS, & CORN **PEER REVIEWED** [SRI

3. METHOMYL IS USED AS FOLIAR TREATMENT FOR CONTROL OF MANY INSECTS SUCH AS APHIDS, ARMYWORMS, CABBAGE LOOPER, TOBACCO BUDWORM, TOMATO FRUITWORM, COTTON LEAF PERFORATOR, COTTON BOLLWORM **PEER REVIEWED** [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987. 550

4. IS BROAD SPECTRUM INSECTICIDE REGISTERED ON SEVERAL AGRICULTURAL CROPS & COMMERCIALLY GROWN ORNAMENTAL PLANTS, PRIMARILY AGAINST LEPIDOPTEROUS INSECTS ON COLE CROPS, TOBACCO, LETTUCE, COTTON, & TOMATOES **PEER REVIEWED** [National Research Council. Drinking Water & Health Volume 1. Washington, DC: National Academy Press, 1977. 635

Consumption Patterns:

1. ABOUT 50% AS AN INSECTICIDE ON VEGETABLES; ABOUT 50% AS AN INSECTICIDE ON ALFALFA, CORN, COTTON, SOYBEANS, & TOBACCO

(1974) **PEER REVIEWED** [SRI

2. Alfalfa, 17.8%; Grapes, 9.8%; Lettuce, 26%; Sugarbeets, 6.1%; Tomatoes, 8.6%; Citrus, 3.9%; Other vegetables account for most of remainder, 18.1% (1984) /California use, calculated from table/ **PEER REVIEWED** [California State Dept Food and Agriculture. Pesticide Use Report

Annual pp.63-64 (1984)
3. 4.39X10+8 g /Used in California/ **PEER REVIEWED** [California State Dept Food and Agriculture. Pesticide Use Report Annual pp.63-64 (1984)

U.S. Production:
1. (1974) 2.6X10+9 G (EST) **PEER REVIEWED** [SRI
2. (1972) 6.8X10+8 G (EST) **PEER REVIEWED** [SRI

CHEMICAL & PHYSICAL PROPERTIES

Color/Form:
1. COLORLESS CRYSTALLINE SOLID **PEER REVIEWED** [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987. 550
2. WHITE CRYSTALLINE SOLID **PEER REVIEWED** [Farm Chemicals Handbook 1989. Willoughby, OH: Meister Publishing Co., 1989.,p. C-191
3. White, crystalline solid. **QC REVIEWED** [NIOSH. NIOSH Pocket Guide to Chemical Hazards. DHHS (NIOSH) Publication No. 94-116. Washington, D.C.: U.S. Government Printing Office, June 1994. 194

Odor:
1. SLIGHTLY SULFUROUS **PEER REVIEWED** [Farm Chemicals Handbook 1989. Willoughby, OH: Meister Publishing Co., 1989.,p. C-191
2. Slight, sulfur-like odor. **QC REVIEWED** [NIOSH. NIOSH Pocket Guide to Chemical Hazards. DHHS (NIOSH) Publication No. 94-116. Washington, D.C.: U.S. Government Printing Office, June 1994. 194

Melting Point:
1. 78-79 DEG C **PEER REVIEWED** [The Merck Index. 10th ed. Rahway, New Jersey: Merck Co., Inc., 1983. 859

Molecular Weight:
1. 162.20 **PEER REVIEWED** [The Merck Index. 10th ed. Rahway, New Jersey: Merck Co., Inc., 1983. 859

Corrosivity:
1. AQ SOLN NONCORROSIVE **PEER REVIEWED** [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987. 550

Density/Specific Gravity:
1. 1.2946 AT 24 DEG C/4 DEG C **PEER REVIEWED** [The Merck Index. 10th ed. Rahway, New Jersey: Merck Co., Inc., 1983. 859

Octanol/Water Partition Coefficient:
1. log Kow= 0.60 **PEER REVIEWED** [Hansch, C. and A. Leo. The Log P Database. Claremont, CA: Pomona College, 1987. 95

Solubilities:

1. SOL AT 25 DEG C IN WT/WT PERCENT: WATER 5.8; ETHANOL 42; METHANOL 100; ISOPROPANOL 22; ACETONE 73 **PEER REVIEWED** [The Merck Index. 10th ed. Rahway, New Jersey: Merck Co., Inc., 1983. 859
2. SOL IN MOST ORG SOLVENTS **PEER REVIEWED** [National Research Council. Drinking Water & Health Volume 1. Washington, DC: National Academy Press, 1977. 637

Spectral Properties:

1. Intense mass spectral peaks: 54 M/z (100%), 105 M/z (74%), 42 M/z (39%), 87 M/z (29%) **PEER REVIEWED** [Hites, R.A. Handbook of Mass Spectra of Environmental Contaminants. Boca Raton, FL: CRC Press Inc., 1985. 378

Vapor Pressure:

1. 5X10-5 MM HG AT 25 DEG C **PEER REVIEWED** [American Conference of Governmental Industrial Hygienists. Documentation of the Threshold Limit Values and Biological Exposure Indices. 5th ed. Cincinnati, OH:American Conference of Governmental Industrial Hygienists, 1986. 363

SAFETY & HANDLING

Emergency Guidelines

DOT Emergency Guidelines:

1. Health Hazards: Poisonous; may be fatal if inhaled, swallowed or absorbed through skin. Contact may cause burns to skin and eyes. Runoff from fire control or dilution water may give off poisonous gases and cause water pollution. Fire may produce irritating or poisonous gases. /Carbamate pesticide, not otherwise specified/ **PEER REVIEWED** [Department of Transportation. Emergency Response Guidebook 1987. DOT P 5800.4. Washington, DC: U.S. Government Printing Office, 1987.,p. G-55
2. Fire or Explosion: Some of these materials may burn, but none of them ignites readily. Container may explode violently in heat of fire. /Carbamate pesticide, not otherwise specified/ **PEER REVIEWED** [Department of Transportation. Emergency Response Guidebook 1987. DOT P 5800.4. Washington, DC: U.S. Government Printing Office, 1987.,p. G-55
3. Emergency Action: Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind, out of low areas, and ventilate closed spaces before entering. Self-contained breathing apparatus and chemical protective clothing which is specifically recommended by the shipper or producer may be worn but they do not provide thermal protection unless it is stated by the clothing manufacturer. Structural firefighter's protective clothing is not effective with these materials. Remove and isolate contaminated clothing at the site. CALL CHEMTREC AT 1-800-424-9300 AS SOON AS POSSIBLE, especially if there is no local hazardous materials team available. /Carbamate pesticide, not otherwise specified/ **PEER REVIEWED** [Department of Transportation. Emergency Response Guidebook 1987. DOT P 5800.4. Washington, DC: U.S. Government Printing Office, 1987.,p. G-55

4. Fire: Small Fires: Dry chemical, CO2, Halon, water spray or standard foam. Large Fires: Water spray, fog or standard foam is recommended. Move container from fire area if you can do it without risk. Fight fire from maximum distance. Stay away from ends of tanks. Dike fire control water for later disposal; do not scatter the material. /Carbamate pesticide, not otherwise specified/ **PEER REVIEWED** [Department of Transportation. Emergency Response Guidebook 1987. DOT P 5800.4. Washington, DC: U.S. Government Printing Office, 1987.,p. G-55

5. Spill or Leak: Do not touch spilled material; stop leak if you can do it without risk. Use water spray to reduce vapors. Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal. Small Dry Spills: With clean shovel place material into clean, dry container and cover; move containers from spill area. Large Spills: Dike far ahead of liquid spill for later disposal. /Carbamate pesticide, not otherwise specified/ **PEER REVIEWED** [Department of Transportation. Emergency Response Guidebook 1987. DOT P 5800.4. Washington, DC: U.S. Government Printing Office, 1987.,p. G-55
6. First Aid: Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation. /Carbamate pesticide, not otherwise specified/ **PEER REVIEWED** [Department of Transportation. Emergency Response Guidebook 1987. DOT P 5800.4. Washington, DC: U.S. Government Printing Office, 1987.,p. G-55

Flammable Properties

Fire Potential:

1. Liquid formulations flammable. **PEER REVIEWED** [Farm Chemicals Handbook 1989. Willoughby, OH: Meister Publishing Co., 1989.,p. C-191

Fire Fighting Information

Fire Fighting Procedures:

1. If material is on fire or involved in a fire do not extinguish fire unless flow can be stopped. Use water in flooding quantities as fog. Solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water. Apply water from as far a distance as possible. Use "alcohol" foam, dry chemical or carbon dioxide. /Carbamate pesticide, liquid, nos, (compounds and preparations) (agricultural insecticides, nec, liquid); Carbamate pesticide, liquid, nos (compounds and preparations) (agricultural insecticides, nec, liquid); Carbamate pesticide, liquid, nos (compounds and

preparations) (insecticides, other than agricultural, nec/ **PEER REVIEWED** [Association of American Railroads. Emergency Handling of Hazardous Materials in Surface Transportation. Washington, D.C.: Assoc. of American Railroads,Hazardous Materials Systems (BOE), 1987. 133
2. Do not extinguish fire unless flow can be stopped. Use water in flooding quantities as fog. Cool all affected containers with flooding quantities of water. Apply water from as far a distance as possible. Solid streams of water may be ineffective. Use foam, dry chemical, or carbon dioxide. /Carbamate pesticide, liquid nos (compounds and preparations) (insecticides, other than agricultural,

nec)/ **PEER REVIEWED** [Association of American Railroads. Emergency Handling of Hazardous Materials in Surface Transportation. Washington, D.C.: Assoc. of American Railroads,Hazardous Materials Systems (BOE), 1987. 133

3. Extinguish fire using agent suitable for type of surrounding fire. (Material itself does not burn or burns with difficulty.) Use water in flooding quantities as fog. Use "alcohol" foam, dry chemical or carbon dioxide. /Carbamate pesticide, solid, nos (compounds and preparations) (insecticides, other than agricultural, nec)/ **PEER REVIEWED** [Association of American Railroads. Emergency Handling of Hazardous Materials in Surface Transportation. Washington, D.C.: Assoc. of American Railroads,Hazardous Materials Systems (BOE), 1987. 134
4. Extinguish fire using agent suitable for type of surrounding fire. (Material itself does not burn or burns with difficulty.) Use water in flooding quantities as fog. Use foam, dry chemical, or carbon dioxide. /Carbamate pesticide, solid, nos (compounds and preparations) (agricultural insecticides, nec, other than liquid)/ **PEER REVIEWED** [Association of American Railroads. Emergency Handling of Hazardous Materials in Surface Transportation. Washington, D.C.: Assoc. of American Railroads,Hazardous Materials Systems (BOE), 1987. 134

Hazardous Reactions

Reactivities and Incompatibilities:

1. Strong bases. **QC REVIEWED** [NIOSH. NIOSH Pocket Guide to Chemical Hazards. DHHS (NIOSH) Publication No. 94-116. Washington, D.C.: U.S. Government Printing Office, June 1994. 194

Preventive Measures

Protective Equipment and Clothing:

1. Wear protective clothing, goggles, and a mask or respirator suitable for protection against methomyl vapors or dusts. **PEER REVIEWED** [Farm Chemicals Handbook 1989. Willoughby, OH: Meister Publishing Co., 1989.,p. C-191
2. Wear positive pressure self-contained breathing apparatus. ... Wear appropriate chemical protective clothing. /Carbamate pesticide, liquid, nos (compounds and preparations) (agricultural insecticides, nec, liquid)/

PEER REVIEWED [Association of American Railroads. Emergency Handling of Hazardous Materials in Surface Transportation. Washington, D.C.: Assoc. of American Railroads,Hazardous Materials Systems (BOE), 1987. 133

3. Wear appropriate chemical protective gloves, boots and goggles. ... Wear positive pressure self-contained breathing apparatus when fighting fires involving this material. /Carbamate pesticide, liquid, nos (compounds and preparations) (agricultural insecticides, nec, liquid); carbamate pesticide, liquid, nos (compounds and preparations) (insecticides, other than agricultural, nec)/ **PEER REVIEWED** [Association of American Railroads. Emergency Handling of Hazardous Materials in Surface Transportation. Washington, D.C.: Assoc. of

American Railroads,Hazardous Materials Systems (BOE), 1987. 133

4. Wear positive pressure self-contained breathing apparatus. ... Wear appropriate chemical protective clothing. /Carbamate pesticide, liquid, nos (compounds and preparations) (insecticides, other than agricultural, nec)/ **PEER REVIEWED** [Association of American Railroads. Emergency Handling of Hazardous Materials in Surface Transportation. Washington, D.C.: Assoc. of American Railroads,Hazardous Materials Systems (BOE), 1987. 133
5. Wear appropriate chemical protective gloves, boots and goggles. ... Wear positive pressure self-contained breathing apparatus when fighting fires involving this material. /Carbamate pesticide, solid, not otherwise specified (compounds and preparations) (insecticides, other than agricultural, not elsewhere classified); Carbamate pesticide, solid, not otherwise specified (compounds and preparations) (agricultural insecticides, not elsewhere classified, other than liquid)/ **PEER REVIEWED** [Association of American Railroads. Emergency Handling of Hazardous Materials in Surface Transportation. Washington, D.C.: Assoc. of American Railroads,Hazardous Materials Systems (BOE), 1987. 134
6. Wear appropriate personal protective clothing to prevent skin contact. **QC REVIEWED** [NIOSH. NIOSH Pocket Guide to Chemical Hazards. DHHS (NIOSH) Publication No. 94-116. Washington, D.C.: U.S. Government Printing Office, June 1994. 194
7. Wear appropriate eye protection to prevent eye contact. **QC REVIEWED** [NIOSH. NIOSH Pocket Guide to Chemical Hazards. DHHS (NIOSH) Publication No. 94-116. Washington, D.C.: U.S. Government Printing Office, June 1994. 194
8. Facilities for quickly drenching the body should be provided within the immediate work area for emergency use where there is a possibility of exposure. [Note: It is intended that these facilities should provide a sufficient quantity or flow of water to quickly remove the substance from any body areas likely to be exposed. The actual determination of what constitutes an adequate quick drench

facility depends on the specific circumstances. In certain instances, a deluge shower should be readily available, whereas in others, the availability of water from a sink or hose could be considered adequate.] **QC REVIEWED** [NIOSH. NIOSH Pocket Guide to Chemical Hazards. DHHS (NIOSH) Publication No. 94-116. Washington, D.C.: U.S. Government Printing Office, June 1994. 194

Other Protective Measures:

1. Smoking, eating and drinking before washing should be absolutely prohibited when any pesticide of moderate or higher toxicity is being handled or used. /Pesticides/ **PEER REVIEWED** [International Labour Office. Encyclopedia of Occupational Health and Safety. Vols. I&II. Geneva, Switzerland: International Labour Office, 1983. 1619
2. If material /is/ not involved in fire keep material out of

water sources and sewers. Build dikes to contain flow as necessary. /Carbaryl (agricultural insecticides, nec, liquid); Carbaryl (agricultural insecticides, nec, other than liquid); Carbaryl (insecticides, other than agricultural, nec)/ **PEER REVIEWED** [Association of American Railroads. Emergency Handling of Hazardous Materials in Surface Transportation. Washington, D.C.: Assoc. of American Railroads,Hazardous Materials Systems (BOE), 1987. 134

3. Keep upwind. ... Avoid breathing vapors or dusts. Wash away any material which may have contacted the body with copious amounts of water or soap and water. /Carbaryl (agricultural insecticides, nec, liquid); Carbaryl (agricultural insecticides, nec, other than liquid); Carbaryl (insecticides, other than agricultural, nec/ **PEER REVIEWED** [Association of American Railroads. Emergency Handling of Hazardous Materials in Surface Transportation. Washington, D.C.: Assoc. of American Railroads,Hazardous Materials Systems (BOE), 1987. 134
4. If material /is/ not on fire and not involved in fire keep sparks, flames, and other sources of ignition away. Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Attempt to stop leak if without undue personnel hazard. Use water spray to knock-down vapors. /Carbamate pesticide, liquid, nos (compounds and preparations) (agricultural insecticides, nec, liquid); Carbamate pesticide, liquid, nos (compounds and preparations) (insecticides, other than agricultural, nec)/ **PEER REVIEWED** [Association of American Railroads. Emergency Handling of Hazardous Materials in Surface Transportation. Washington, D.C.: Assoc. of American Railroads,Hazardous Materials Systems (BOE), 1987. 133
5. If material /is/ not on fire and not involved in fire keep sparks, flames, and other sources of ignition away. Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Use water spray to knock-down vapors. /Carbamate pesticide, liquid, nos (compounds and

preparations) (agricultural insecticides, nec, liquid/ **PEER REVIEWED** [Association of American Railroads. Emergency Handling of Hazardous Materials in Surface Transportation. Washington, D.C.: Assoc. of American Railroads,Hazardous Materials Systems (BOE), 1987. 133

6. If material /is/ not on fire and not involved in fire keep sparks, flames, and other sources of ignition away. Keep material out of water sources and sewers. /Carbamate pesticide, solid, nos (compounds and preparations) (insecticides, other than agricultural, nec); Carbamate pesticide, solid, nos (compounds and preparations) (agricultural insecticides, nec, other than liquid)/ **PEER REVIEWED** [Association of American Railroads. Emergency Handling of Hazardous Materials in Surface Transportation. Washington, D.C.: Assoc. of American Railroads,Hazardous Materials Systems (BOE), 1987. 134
7. Avoid breathing vapors. Keep upwind. ... Avoid bodily contact with the material. ... Do not handle broken

packages unless wearing appropriate personal protective equipment. Wash away any material which may have contacted the body with copious amounts of water or soap and water. /Carbamate pesticide, liquid, nos (compounds and preparations) (agricultural insecticides, nec, liquid); carbamate pesticide, liquid, nos (compounds and preparations) (insecticides, other than agricultural, nec)/ **PEER REVIEWED** [Association of American Railroads. Emergency Handling of Hazardous Materials in Surface Transportation. Washington, D.C.: Assoc. of American Railroads,Hazardous Materials Systems (BOE), 1987. 133

8. Avoid breathing dusts, and fumes from burning material. Keep upwind. Avoid bodily contact with the material. ... Do not handle broken packages unless wearing appropriate personal protective equipment. Wash away any material which may have contacted the body with copious amounts of water or soap and water. ... If contact with the material anticipated, wear appropriate chemical protective clothing. /Carbamate pesticide, solid, nos (compounds and preparations) (insecticides, other than agricultural, nec); Carbamate pesticide, solid, nos (compounds and preparations) (agricultural insecticides, nec, other than liquid)/ **PEER REVIEWED** [Association of American Railroads. Emergency Handling of Hazardous Materials in Surface Transportation. Washington, D.C.: Assoc. of American Railroads,Hazardous Materials Systems (BOE), 1987. 134
9. The worker should immediately wash the skin when it becomes contaminated. **QC REVIEWED** [NIOSH. NIOSH Pocket Guide to Chemical Hazards. DHHS (NIOSH) Publication No. 94-116. Washington, D.C.: U.S. Government Printing Office, June 1994. 194
10. Work clothing that becomes wet or significantly contaminated should be removed or replaced. **QC REVIEWED** [NIOSH. NIOSH Pocket Guide to Chemical Hazards.

DHHS (NIOSH) Publication No. 94-116. Washington, D.C.: U.S. Government Printing Office, June 1994. 194

11. Workers whose clothing may have become contaminated should change into uncontaminated clothing before leaving the work premises. **QC REVIEWED** [NIOSH. NIOSH Pocket Guide to Chemical Hazards. DHHS (NIOSH) Publication No. 94-116. Washington, D.C.: U.S. Government Printing Office, June 1994. 194

Other Safety & Handling

Stability/Shelf Life:

1. STABLE IN NEUTRAL OR SLIGHTLY ACIDIC SOLN **PEER REVIEWED** [National Research Council. Drinking Water & Health Volume 1. Washington, DC: National Academy Press, 1977. 637
2. Aqueous solutions decompose slowly at room temperature, more rapidly on aeration, in sunlight, in alkaline media or at higher temperatures. **PEER REVIEWED** [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987. 550

Shipment Methods and Regulations:

1. No person may /transport,/ offer or accept a hazardous material for transportation in commerce unless that material is properly classed, described, packaged, marked, labeled, and in condition for shipment as required or authorized by ... /the hazardous materials regulations (49 CFR 171-177)./ **PEER REVIEWED** [49 CFR 171.2 (10/1/87)
2. Domestic Transportation: Chemical: Carbamate pesticide, solid, not otherwise specified. Primary Hazard Class: Poison B. A poison B is a substance that is known to be toxic to humans and poses a severe health hazard if released during transportation. UN 2757. Label(s) required: Poison. Acceptable Modes of Transportation: Air, rail, road, and water. /Carbamate pesticide, solid, nos/ **PEER REVIEWED** [49 CFR 172.101 (10/1/87)
3. Int'l Air Shipments: Chemical: Carbamate pesticide, solid, toxic, not otherwise specified. IMO Class: 6.1. UN 2757. Primary hazard label: Poison (packaging group I, II). Primary hazard label: Keep away from food (packaging group III) Additional packaging instructions listed in the table must also be followed. /Carbamate pesticide, solid, toxic, nos/ **PEER REVIEWED**
4. International Water Shipments: Chemical: Carbamate pesticide, solid, toxic, not otherwise specified. IMO Class: 6.1, Poisons. UN 2757. Packaging Group: I, II. Label(s) required: Poison. Packaging Group: III. Label required: Harmful, stow away from foodstuffs. Transportation of carbamate pesticide, solid, not otherwise specified is limited on passenger vessels. /Carbamate pesticide, solid, toxic, nos/ **PEER REVIEWED** [IMDG; International Maritime Dangerous Goods Code; International Maritime Organization p.6145 (1986)
5. Int'l Air Shipments: Chemical: Carbamate pesticides, liquid, toxic, flammable, NOS, flashpoint 23 deg C or

more. IMO Class: 6.1. UN 2991. Primary hazard label: Poison (packaging group I, II). Primary hazard label: Keep away from food (packagine group III). Additional packaging instructions listed in the table must also be followed. /Carbamate pesticides, liquid, toxic, flammable, nos, flashpoint 23 deg C or more/ **PEER REVIEWED** [IATA. Dangerous Goods Regulations. 31st ed. Montreal, Canada: International Air Transport Assoc., Dangerous Goods Board, Jan. 1, 1990. 96

6. International Water Shipments: Chemical: Carbamate pesticides, liquid, toxic, flammable, nos. IMO Class: 6.1, Poisons. UN 2991. Packaging Group: I, II. Label required: Poison. Packaging Group: III. Label required: Harmful, stow away from foodstuffs & flammable liquid. /Carbamate pesticides, liquid, toxic, flammable, nos/ **PEER REVIEWED** [IMDG; International Maritime Dangerous Goods Code; International Maritime Organization p.6194 (1988)
7. Domestic Transportation: Chemical: Carbamate pesticides, liquid, nos (compounds and preparations). Primary Hazard Class: Flammable liquid. A flammable liquid is any liquid that has a flash point below 100 deg F (37 deg C). UN 2758. Label(s) required: Flammable liquid. Acceptable

Modes of Transportation: Air, rail, road, and water. /Carbamate pesticides, liquid, nos (compounds and preparations)/ **PEER REVIEWED** [49 CFR 172.101 (10/1/89)

8. Int'l Air Shipments: Chemical: Carbamate pesticides, liquid, flammable, toxic, nos, flashpoint less than 23 deg C. IMO Class: 3. UN 2758. Primary hazard label: Flammable liquid, poison (packaging group I). Additional packaging instructions listed in the table must also be followed. Carbamate pesticides, liquid, flammable, toxic, NOS, flashpoint less than 23 deg C is forbidden for transport on passenger aircraft. /Carbamate pesticides, liquid, flammable, toxic, nos, flashpoint less than 23 deg C/ **PEER REVIEWED** [IATA. Dangerous Goods Regulations. 31st ed. Montreal, Canada: International Air Transport Assoc., Dangerous Goods Board, Jan. 1, 1990. 96
9. International Water Shipments: Chemical: Carbamate pesticides, liquid, flammable, toxic, nos. IMO Class: 3.2, Flammable liquids. UN 2758. Packaging Group: I, II. Label(s) required: Flammable liquid. /Carbamate pesticides, liquid, flammable, toxic, nos/ **PEER REVIEWED** [IMDG; International Maritime Dangerous Goods Code; International Maritime Organization p.3097-1 (1988)
10. Int'l Air Shipments: Chemical: Carbamate pesticides, liquid, toxic, nos. IMO Class: 6.1. UN 2992. Primary hazard label: Poison (packaging group I, II). Primary hazard label: Keep away from food (packaging group III). Additional packaging instructions listed in the table must also be followed. /Carbamate pesticides, liquid, toxic, nos/ **PEER REVIEWED** [IATA. Dangerous Goods Regulations. 31st ed. Montreal, Canada: International Air Transport Assoc., Dangerous Goods Board, Jan. 1, 1990. 96
11. International Water Shipments: Chemical: Carbamate

pesticides, liquid, toxic, nos. IMO Class: 6.1, Poisons. UN 2992. Packaging Group: I, II. Label required: Poison. Packaging Group: III. Label required: Harmful, stow away from foodstuffs. /Carbamate pesticides, liquid, toxic, nos/ **PEER REVIEWED** [IMDG; International Maritime Dangerous Goods Code; International Maritime Organization p.6193 (1988)

12. Domestic Transportation: Chemical: Carbamate pesticides, liquid, nos (compounds and preparations). Primary Hazard Class: Poison B. Poison B: These materials are liquids or solids which are toxic to humans through ingestion, inhalation, or absorption. Some of these poisons are flammable and expert advice from the shipper should be obtained if possible. UN 2757. Label(s) required: Poison. Acceptable Modes of Transportation: Air, rail, road, and water. /Carbamate pesticides, liquid, nos (compounds and preparations/ **PEER REVIEWED** [49 CFR 172.101 (10/1/89)

Storage Conditions:

1. Keep /liq formulations/ away from heat, sparks, & open flame. Do not subject liquid to temperatures below 32 deg F. **PEER REVIEWED** [Farm Chemicals Handbook 1989. Willoughby, OH: Meister Publishing Co., 1989.,p. C-191

Cleanup Methods:

1. A system for removing pesticides from the wash water

produced by pesticide applicators as they clean their equipment has been developed. The first step is the flocculation/coagulation and sedimentation of the pesticide-contaminated wash water. The supernatant from the first step is then passed through activated carbon columns. /Pesticides/ **PEER REVIEWED** [Nye JC; ACS Symp Ser 259 (Treat Disposal Pestic Wastes): 153-60 (1984)

Disposal Methods:

1. Generators of waste (equal to or greater than 100 kg/mo) containing this contaminant, EPA hazardous waste number P066, must conform with USEPA regulations in storage, transportation, treatment and disposal of waste. **PEER REVIEWED** [40 CFR 240-280, 300-306, 702-799 (7/1/89)
2. Landfill: The aqueous soln is noncorrosive. It is stable as a solid, in aqueous soln under normal conditions but is subject to decomposition in moist soil. **PEER REVIEWED** [United Nations. Treatment and Disposal Methods for Waste Chemicals (IRPTC File). Data Profile Series No. 5. Geneva, Switzerland: United Nations Environmental Programme, Dec. 1985. 75
3. Hydrolysis: Alkaline hydrolysis leads to complete degradation. Carbonate, methylamine, and 5-methyl-n-hydroxylthioacetamidate are nontoxic. Recommendable methods: Incineration, landfill. Peer-review: Dissolve methomyl in water and spray into a furnace with effluent gas scrubbing. (Peer-review conclusions of an IRPTC expert consultation (May 1985)) **PEER REVIEWED** [United Nations. Treatment and Disposal Methods for Waste Chemicals (IRPTC File). Data Profile Series No. 5. Geneva, Switzerland: United Nations

Environmental Programme, Dec. 1985. 75

4. Potential candidate for disposal by rotary kiln incineration with a temperature range of 820-1600 deg C and a residence time of seconds for liquids and gases, and hours for solids. Also a potential candidate for fluidized bed incineration with a temperature range of 450-980 deg C, with a residence time of seconds for liquids and gases, and longer for solids. **PEER REVIEWED** [USEPA; Engineering Handbook for Hazardous Waste Incineration p.3-9 (1981) EPA 68-03-3025
5. Group I Containers: Combustible containers from organic or metallo-organic pesticides (except organic mercury, lead, cadmium, or arsenic compounds) should be disposed of in pesticide incinerators or in specified landfill sites. /Organic or metallo-organic pesticides/ **PEER REVIEWED** [40 CFR 165 (7/1/88)
6. Group II Containers: Noncombustible containers from organic or metallo-organic pesticides (except organic mercury, lead, cadmium, or arsenic compounds) must first be triple-rinsed. Containers that are in good condition may be returned to the manufacturer or formulator of the pesticide product, or to a drum reconditioner for reuse with the same type of pesticide product, if such reuse is legal under Department of Transportation regulations (eg 49 CFR 173.28). Containers that are not to be reused should be punctured ... and transported to a scrap metal

facility for recycling, disposal or burial in a designated landfill. /Organic or metallo-organic pesticides/ **PEER REVIEWED** [40 CFR 165 (7/1/88)

TOXICITY/BIOMEDICAL EFFECTS

Toxicity Excerpts

Human Toxicity Excerpts:

1. Three men died after ingesting approx 12 to 15 mg/kg body wt of methomyl accidentally baked in bread. A fourth who, like the others, displayed twitching, spasms, fasciculations, & difficulty in respiratory embarrassment, responded ... to ... treatment. **PEER REVIEWED** [Gosselin, R.E., R.P. Smith, H.C. Hodge. Clinical Toxicology of Commercial Products. 5th ed. Baltimore: Williams and Wilkins, 1984.,p. II-307
2. A 31 yr old housewife committed suicide with her 3 children by taking Lannate refreshments. Her 9 yr old son survived, while the other children were dead at the scene. Autopsies of the mother and her 6 yr old son revealed pale red froth in the nose and mouth. Petechial hemorrhages in palpebral conjunctiva and myosis were observed. The mucous membrane of the stomach was blackish brown, markedly edematous and congested. The lungs were heavy and congested./Microscopic examination/ revealed edema, congestions, and hemorrhages of various tissues due to acute circulatory failure. The estimated doses ingested were approx 55 mg/kg (2.75 g) to the mother and approx 13 mg/kg (0.26 g) to her son, respectively. **PEER REVIEWED** [Araki M et al; Nippon Hoigaku Zasshi 36 (4): 584-8 (1982)

3. In a survey of occupationally acquired disease in workers at a pesticide plant, 11% of 102 workers were hospitalized for illness related to chemical exposures; highest hospitalization rates occurred in packaging (27%), production (22%), and maintenance (9%) workers. The most common causes of hospitalization were intoxication by the carbamate pesticide methomyl (1-(methylthio)ethylideneamino methyl carbamate), a reversible cholinesterase inhibitor, and methemoglobinemia following exposure to 3,4-dichloroaniline. On clinical evaluation, 5 (46%) of 11 packaging workers, the group with the highest exposure to methomyl, had experienced blurred vision or pupillary constriction. **PEER REVIEWED** [Morse DL et al; Clin Toxicol 15 (1): 13-21 (1979)
4. IN VIEW OF ... PAUCITY OF DATA ON MUTAGENICITY, CARCINOGENICITY, & LONG-TERM ORAL TOXICITY OF METHOMYL, ESTIMATES OF EFFECTS OF CHRONIC ORAL EXPOSURE AT LOW LEVELS CANNOT BE MADE ... EFFECTS IN HUMANS HAVE NOT BEEN WELL-DOCUMENTED & EFFORTS SHOULD BE MADE IN THIS DIRECTION. **PEER REVIEWED** [National Research Council. Drinking Water & Health Volume 1. Washington, DC: National Academy Press, 1977. 643
5. Cholinesterase activity measurements for 542 California agricultural pesticide applicators under medical supervision during the first 9 mo of 1985 were analyzed. Medical records of applicators were used if the subject had been exposed for over 3 hr in a 30 day period to

category I and II organophosphate and carbamate pesticides. Employers of all workers with cholinesterase activity depressions that fell to 70% or less of the workers's plasma or RBC baselines were contacted to obtain a list of pesticides handled in the 2 wk interval preceding the greatest reported cholinesterase activity depression. In evaluating pesticide exposure data it was not possible to distinguish listed pesticides primarily or cumulatively responsible for the noted cholinesterase activity depressions from those not responsible for the cholinesterase activity depression, but coincidentally used during the same period. The pesticides associated with plasma or RBC cholinesterase activity depression to 70% of baseline or lower were listed. Methomyl usage in California for 1985 was 966,100 lb. The frequency of methomyl by % of baseline to depress cholinesterase activity was 2 for plasma (< 50% reduction) and 12 and 7 for RBC (< 70% and 60% reductions, respectively). Twenty six workers, 4.8% of the sample, had cholinesterase values at or below the California action limit value for removal from continued exposure to cholinesterase inhibiting pesticides. Eight of these 26 workers, 31.5%, had pesticide related illnesses. **PEER REVIEWED** [Ames RG et al; Am J Ind Med 15 (2): 143-50 (1989)

Non-Human Toxicity Excerpts:

1. MUTAGENICITY: MUTATION RESEARCH 87: 17 (1981). SISTER

CHROMATID EXCHANGE - IN VITRO CHROMOSOMAL EFFECT STUDIES, NON-HUMAN: QUESTIONABLE. **PEER REVIEWED** [GENE-TOX Program: Current Status of Bioassay in Genetic Toxicology. U.S. Environmental Protection Agency, Washington, DC. Office of Toxic Substances and Pesticides.(For program information, contact Environmental Mutagen Information Center, Oak Ridge National Laboratory, Post Office Box Y, Oak Ridge, Tennessee 37830. Telephone (615) 574-7871)

2. 30-DAY EMLD /EMPIRICAL MINIMUM LETHAL DOSAGE/ FOR 17- TO 22-WK-OLD MALLARDS ... IS 7.5 MG/KG/DAY FOR BOTH SEXES. THE RESULTING CUMULATIVE TOXICITY INDEX IS 15.9/7.5 = 2.1, INDICATING LITTLE OR NO CUMULATIVE TOXIC ACTION. /SAMPLE PURITY 90%/ **PEER REVIEWED** [U.S. Department of the Interior, Fish and Wildlife Service. Handbook of Toxicity of Pesticides to Wildlife. Resource Publication 153. Washington, DC: U.S. Government Printing Office, 1984. 52
3. SIGNS OF INTOXICATION /IN MALLARDS FROM ACUTE ORAL EXPOSURE/: HIGH CARRIAGE, ATAXIA, DROWSINESS, TACHYPNEA, DYSPNEA, SALIVATION, TENESMUS, DIARRHEA, TREMORS, TETANY, OR WING-BEAT CONVULSIONS. **PEER REVIEWED** [U.S. Department of the Interior, Fish and Wildlife Service. Handbook of Toxicity of Pesticides to Wildlife. Resource Publication 153. Washington, DC: U.S. Government Printing Office, 1984. 52
4. THREE-GENERATION REPRODUCTION STUDY ... IN RATS. MALES & FEMALES WERE FED DIETARY LEVELS OF 50 & 100 PPM FOR 3 MO AFTER WHICH ANIMALS WERE MATED. F1 GENERATION WAS CONTINUED ON THE DIETS FOR 3 MO AFTER WHICH TIME THEY WERE BRED TO PRODUCE THE SECOND GENERATION. THE PROCEDURE WAS REPEATED FOR 3RD GENERATION. EACH GENERATION WAS SUBJECTED

TO ... HISTOPATHOLOGICAL EXAM ... NO ADVERSE EFFECTS UPON REPRODUCTION ... @ EITHER FEEDING LEVEL. **PEER REVIEWED** [National Research Council. Drinking Water & Health Volume 1. Washington, DC: National Academy Press, 1977. 641

5. NEW ZEALAND WHITE RABBITS WERE FED METHOMYL AT DIETARY LEVELS OF 0, 50, & 100 PPM ON DAYS 8 THROUGH 16 OF GESTATION. WHEN FETUSES WERE EXAMINED, THERE WAS NO EVIDENCE OF TERATOGENIC EFFECTS. ALIZARIN-STAINED SKELETONS REVEALED NO ABNORMALITIES IN BONE STRUCTURE. **PEER REVIEWED** [National Research Council. Drinking Water & Health. Volume 5. Washington, D.C.: National Academy Press, 1983. 59
6. NO ADVERSE EFFECTS WERE NOTED WHEN FIELD-CAGED BOBWHITE QUAIL & ALBINO RABBITS (WITH FOOD & WATER EXPOSED) WERE OVERSPRAYED 6 TIMES (AT 5-DAY INTERVALS) WITH 1 KG ACTIVE INGREDIENT (AS WATER SOL POWDER) IN 280 L OF WATER/HECTARE. RELATIVELY NONTOXIC TO HONEY BEES ONCE THE SPRAY HAS DRIED. **PEER REVIEWED** [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987. 550
7. THE MUTAGENIC ACTIVITY OF METHOMYL & 4 OTHER METHYL CARBAMATE INSECTICIDES WAS INVESTIGATED USING HISTIDINE AUXOTROPHS (HIS TA98, HIS TA100, HIS TA1535, HIS TA1537

AND HIS TA1538) OF SALMONELLA TYPHIMURIUM LT2 DERIVED BY AMES. THE METHYL CARBAMATE INSECTICIDES DID NOT CAUSE A SIGNIFICANT INCR IN THE NUMBER OF REVERTANT COLONIES IN THE STRAINS USED. THE NITROSO DERIV OF THE TESTED INSECTICIDES ARE POTENT MUTAGENS. PARENT INSECTICIDES ARE NON-MUTAGENIC. **PEER REVIEWED** [BLEVINS RD ET AL; MUTAT RES 56 (1): 1-6 (1977)

8. In a 22 month study of rats exposed to methomyl in nutritionally adequate diet, there was a decreased hemoglobin level at 200 to 400 ppm along with significantly ... higher testicle to body wt ratio in 400 ppm males & histopathological alterations in kidneys of males & females at 400 ppm & in the spleens of females at 200 & 400 ppm. ... A suggested chronic "no-effect" level of 100 ppm for rats /was noted/. **PEER REVIEWED** [National Research Council. Drinking Water & Health. Volume 5. Washington, D.C.: National Academy Press, 1983. 58
9. TWO OF FOUR MALE DOGS ON DIETARY LEVEL OF 1,000 PPM SHOWED TYPICAL SIGNS OF POISONING, & 2 FEMALES AT THIS LEVEL DIED. DOGS ON DIETARY LEVELS OF 50, 100, 400 PPM FOR 2 YR SHOWED NO CLINICAL EFFECT. NO CHARACTERISTIC SIGNS OF COMPOUND-RELATED EFFECTS WERE NOTED IN APPETITE, ELIMINATION, CHANGE OF BODY WT, OR CLINICAL LAB FINDINGS, EXCEPT THAT MOST DOGS AT 1,000 PPM SHOWED SOME DEGREE OF ANEMIA. TUBULAR CHANGES IN KIDNEYS & HEMATOPOIESIS IN SPLEEN WAS SEEN IN SOME ANIMALS THAT HAD RECEIVED 400 OR 1,000 PPM FOR 2 YR. THOSE THAT RECEIVED 1,000 PPM ALSO SHOWED SLIGHT INCR IN ACTIVITY OF BONE MARROW & MINIMAL TO SLIGHT INCR IN BILE DUCT PROLIFERATION. NO TUMORS WERE FOUND. THE NO-EFFECT LEVEL WAS 100 PPM IN ... DOGS (2.1 MG/KG/DAY). **PEER REVIEWED** [Hayes, Wayland J., Jr.

Pesticides Studied in Man. Baltimore/London: Williams and Wilkins, 1982. 455

10. SINGLE (UP TO 800 PPM) ORAL DOSING OF METHOMYL TO RATS CAUSED NO BRAIN CHOLINESTERASE CHANGES & NO ALTERATIONS IN TOTAL LIPIDS, CHOLESTEROL LEVELS, OR LIVER PROTEIN CONTENT. CHRONIC ORAL DOSES OF 100 & 200 PPM TO RATS CAUSED DECREASED CHOLINESTERASE ACTIVITY ONLY IN FEMALES. **PEER REVIEWED** [BEDO M ET AL; BIBL NUTR DIETA 29: 20-31 (1980)
11. METHOMYL DID NOT INDUCE ANY RECESSIVE LETHALS WHEN TESTED ON DROSOPHILA MELANOGASTER. HOWEVER, IN AMES TEST, METHOMYL DID INDUCE POINT MUTATIONS BY RESTORING HISTIDINE AUXOTROPHS OF SALMONELLA TYPHIMURIUM TO PROTOTROPHY WITHOUT METABOLIC ACTIVATION. **PEER REVIEWED** [GOPALAN HNB ET AL; GENETICS 97 (S1): S44 (1981)
12. METHOMYL INDUCED MITOSTATIC EFFECTS IN THE ROOT MERISTEM CELLS OF THE BEAN PLANT (VICIA FABA). PYCNOTIC NUCLEI & PREMATURE CHROMOSOME CONDENSATION WERE OBSERVED. ALL EFFECTS WERE EVIDENT AFTER 120 MIN AT 102 PPM. **PEER REVIEWED** [NJAGI GDE ET AL; CYTOLOGIA 46 (1-2): 169-72 (1981)
13. In rabbits treated with methomyl via a stomach tube, 2 of

12 treated animals died 20 and 23 min, respectively, after admin of 40 mg methomyl/kg, and 10 of them survived for longer than 6 hr. The lethal blood concn was estimated to be greater than 1 ug/g. **PEER REVIEWED** [Noda J; Nippon Hoigaku Zasshi 38 (1): 71-82 (1984)
14. Wild mice collected in live-traps from fields sprayed with methomyl at 505 g/ha showed an overall 11.2% inhibition of brain acetylcholinesterase (AchE) activity. **PEER REVIEWED** [Montz WE Jr et al; Bull Environ Contam Toxicol 31 (2): 158-63 (1983)
15. The LC50 of herbicides and insecticides in aq emulsion were measured for mallards by egg immersion. Methomyl and phosmet were only slightly toxic or not toxic (LC50s of 178 to greater than 500 lb/acre; 199-560 kg/ha). **PEER REVIEWED** [Hoffman DJ, Albers PH; Arch Environ Contam Toxicol 13 (1): 15-28 (1984)
16. The impact of weekly applications of avermectin, cyromazine, and methomyl on leaf miners and an associated complex of six parasite species was evaluated in celery. Avermectin suppressed pest populations but did not adversely affect adult parasite mortality. Cyromazine also reduced leaf miner density. But significant reductions in survival and emergence of immature parasites greatly diminished the potential for biological control by lowering the seasonal percent parasitism. Species composition of the parasite complex was least affected by avermectin and methomyl. **PEER REVIEWED** [Trumble JT; Agric Ecosyst Env 12 (3): 181-8 (1985)
17. /Data from acute toxicity studies on fathead minnows exposed to LC50 concn of 99% pure methomyl for 96 hr showed that/ affected fish lost schooling behavior, were hyperactive & swam near the tank surface. They were also overreactive to external stimuli, had incr resp, were darkly colored & lost equilibrium prior to death. **PEER

Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987. 550
2. LD50 Rat oral 47 mg active ingredient (as wettable powder)/kg **PEER REVIEWED** [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987. 550
3. LD50 Rabbit percutaneous 4080 mg ai (as 240 g/l liq)/kg **PEER REVIEWED** [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987. 550
4. LD50 Rat (male) oral 17 mg active ingredient **PEER REVIEWED** [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987. 550

Ecotoxicity Values:

1. LD50 8-MO OLD MALE MALLARD ORAL 15.9 MG/KG (95% CONFIDENCE LIMIT 11.4-22.0 MG/KG /SAMPLE PURITY 90%/ **PEER REVIEWED** [U.S. Department of the Interior, Fish and Wildlife Service. Handbook of Toxicity of Pesticides to Wildlife. Resource Publication 153. Washington, DC: U.S. Government Printing Office, 1984. 52
2. LD50 3-4-MO OLD MALE PHEASANT ORAL 15.0 MG/KG (95% CONFIDENCE LIMIT 10.0-22.3 MG/KG /SAMPLE PURITY 90%/ **PEER REVIEWED** [U.S. Department of the Interior, Fish and Wildlife Service. Handbook of Toxicity of Pesticides to Wildlife. Resource Publication 153. Washington, DC: U.S. Government Printing Office, 1984. 52
3. LD50 13-MO OLD MALE MULE DEER ORAL 11.0-22.0 MG/KG /SAMPLE PURITY 90%/ **PEER REVIEWED** [U.S. Department of the Interior, Fish and Wildlife Service. Handbook of Toxicity of Pesticides to Wildlife. Resource Publication 153. Washington, DC: U.S. Government Printing Office, 1984. 52
4. LC50 14-DAY OLD BOBWHITE QUAIL ORAL APPROX 1100 PPM IN 5-DAY DIET **PEER REVIEWED** [U.S. Department of the Interior, Fish and Wildlife Service, Bureau of Sports Fisheries and Wildlife. Comparative Dietary Toxicities of Pesticides to Birds. Special Scientific Report--Wildlife No. 152.Washington, DC: U.S. Government Printing Office, 1972. 37
5. LC50 14-DAY OLD JAPANESE QUAIL ORAL 3124 PPM IN 5-DAY DIET (95% CONFIDENCE LIMIT 2513-3940 PPM), AGE 14 DAYS **PEER REVIEWED** [U.S. Department of the Interior, Fish and Wildlife Service, Bureau of Sports Fisheries and Wildlife. Comparative Dietary Toxicities of Pesticides to Birds. Special Scientific Report--Wildlife No. 152.Washington, DC: U.S. Government Printing Office, 1972. 37
6. LC50 14-DAY OLD RING-NECKED PHEASANT ORAL 1975 PPM IN 5-DAY DIET (95% CONFIDENCE LIMIT 1641-2374 PPM) **PEER REVIEWED** [U.S. Department of the Interior, Fish and Wildlife Service, Bureau of Sports Fisheries and Wildlife. Comparative Dietary Toxicities of Pesticides to Birds. Special Scientific Report--Wildlife No. 152.Washington, DC: U.S. Government Printing Office, 1972. 37

REVIEWED** [Geiger D.L., Call D.J., Brooke L.T. (eds). Acute Toxicities of Organic Chemicals to Fathead Minnows (Pimephales Promelas). Vol. IV. Superior Wisconsin:University of Wisconsin-Superior, 1988. 71

18. The chronic effects of repeated inhalation exposure to methomyl powder on male Wistar-rats were investigated. Rats were exposed to methomyl powder (with a mass median aerodynamic diameter of 4.4 micrometers) for a single 4 hour period, or for 4 hours per day, 5 days per week for 3 months. Average exposure concentrations were 9.9 mg/cu m and 14.8 mg/cu m for the single and repeated treatment protocols, respectively. Histopathological studies showed no evidence of toxicity in the lungs, spleen, kidneys, liver, oral and upper respiratory mucosae, organs of sight, auditory organs or brain, even after repeated exposure to methomyl dust. While exposure to methomyl did reduce plasma cholinesterase activity immediately following dosing, such effects were not cumulative in the chronically treated animals. No evidence was observed for changes in lung lipid concentrations in chronically

exposed rats. **PEER REVIEWED** [Tanaka I et al; American Industrial Hygiene Association Journal 48 (4): 330-4 (1987)

19. Lannate 20 a carbamate pesticide was evaluated for its mutagenicity in Drosophila melanogaster by the sex-linked recessive lethals and chromsome II-III translocation tests by continuous larval feeding. The 3 sublethal doses of 0.2, 0.4 and 0.6 microliter of Lannate per 100 ml of the food medium induced a significant ($p< 0.01$) increase in the number of sex-linked recessive lethals over the controls. However, no translocations were observed either in the treated or the control series. **PEER REVIEWED** [Hemavathy KC, Krishnamurthy NB; Mutat Res 191 (1): 41-3 (1987)

20. The effects of the carbamate pesticide Lannate 20 on germ cells were evaluated in mice. Male Swiss albino mice were administered 0, 20, 40, or 60 mg/kg Lannate 20 orally in five divided doses, separated by 24 hr intervals. Selected animals were killed on day 19 or 35 after the last dose. The incidence of abnormal sperm was determined in mice killed on the day 35. Chromosome aberrations in germ cells were determined in mice killed on day 19. The incidence of abnormal sperm as a function of dose was: controls 3.66%; animals given 20 mg/kg, 5.15% ; animals given 40 mg/kg, 7.1%; and mice given 60 mg/kg, 9.47%. Chromosomal aberrations scored as univalents and polyploids were significantly increased by all three doses. Carbamate pesticide Lannate 20 interefers in the differentiation of germ cells at the spermatogonial stage. Carbamate pesticide Lannate 20 is clearly mutagenic in mice. **PEER REVIEWED** [Hemavathy KC, Krishnamurthy NB; Environmental Research 42 (2): 362-5 (1987)

Toxicity Values

Non-Human Toxicity Values:

1. LD50 Rat oral 31 mg active ingredient (as 240 g/l liquid)/kg **PEER REVIEWED** [Worthing, C.R. and S.B.

7. LC50 14-DAY OLD MALLARD ORAL 2883 PPM IN 5-DAY DIET (95% CONFIDENCE LIMIT 2000-4572 PPM) **PEER REVIEWED** [U.S. Department of the Interior, Fish and Wildlife Service, Bureau of Sports Fisheries and Wildlife. Comparative Dietary Toxicities of Pesticides to Birds. Special Scientific Report--Wildlife No. 152.Washington, DC: U.S. Government Printing Office, 1972. 37
8. EC50 DAPHNIA MAGNA 8.8 UG/L/48 HR @ 21 DEG C (95% CONFIDENCE LIMIT 4.1-19 UG/L), FIRST INSTAR /TECHNICAL MATERIAL, 95-98%; STATIC BIOASSAY/ **PEER REVIEWED** [U.S. Department of Interior, Fish and Wildlife Service. Handbook of Acute Toxicity of Chemicals to Fish and Aquatic Invertebrates. Resource Publication No. 137. Washington, DC: U.S. Government PrintingOffice, 1980. 49
9. LC50 PTERONARCELLA 69 UG/L/96 HR @ 7 DEG C (95% CONFIDENCE LIMIT 34-143 UG/L), NAIAD /TECHNICAL MATERIAL, 95-98%;

STATIC BIOASSAY/ **PEER REVIEWED** [U.S. Department of Interior, Fish and Wildlife Service. Handbook of Acute Toxicity of Chemicals to Fish and Aquatic Invertebrates. Resource Publication No. 137. Washington, DC: U.S. Government PrintingOffice, 1980. 49
10. LC50 PTERONARCELLA 60 UG/L/96 HR @ 7 DEG C (95% CONFIDENCE LIMIT 50-80 UG/L), FIRST INSTAR /LIQUID CONCN, 24%; STATIC BIOASSAY/ **PEER REVIEWED** [U.S. Department of Interior, Fish and Wildlife Service. Handbook of Acute Toxicity of Chemicals to Fish and Aquatic Invertebrates. Resource Publication No. 137. Washington, DC: U.S. Government PrintingOffice, 1980. 49
11. LC50 RAINBOW TROUT 1,600 UG/L/96 HR @ 12 DEG C (95% CONFIDENCE LIMIT 1,190-2,150 UG/L), WT 1.1 G /TECHNICAL MATERIAL 95-98%; STATIC BIOASSAY **PEER REVIEWED** [U.S. Department of Interior, Fish and Wildlife Service. Handbook of Acute Toxicity of Chemicals to Fish and Aquatic Invertebrates. Resource Publication No. 137. Washington, DC: U.S. Government PrintingOffice, 1980. 49
12. LC50 RAINBOW TROUT 1,200 UG/L/96 HR @ 12 DEG C (95% CONFIDENCE LIMIT 1,100-1,400 UG/L), WT 1.0 G /LIQUID CONCN, 24%; STATIC BIOASSAY/ **PEER REVIEWED** [U.S. Department of Interior, Fish and Wildlife Service. Handbook of Acute Toxicity of Chemicals to Fish and Aquatic Invertebrates. Resource Publication No. 137. Washington, DC: U.S. Government PrintingOffice, 1980. 49
13. LC50 RAINBOW TROUT 1200 UG/L/96 HR @ 12 DEG C (95% CONFIDENCE LIMIT 764-1,880 UG/L), WT 0.6 G /LIQUID FORMULATION, 29%; STATIC BIOASSAY/ **PEER REVIEWED** [U.S. Department of Interior, Fish and Wildlife Service. Handbook of Acute Toxicity of Chemicals to Fish and Aquatic Invertebrates. Resource Publication No. 137. Washington, DC: U.S. Government PrintingOffice, 1980. 49
14. LC50 CUTTHROAT TROUT 6,800 UG/L/96 HR @ 10 DEG C (95% CONFIDENCE LIMIT 2180-7530 UG/L), WT 1.0 G /TECHNICAL MATERIAL, 95-98%; STATIC BIOASSAY/ **PEER REVIEWED** [U.S. Department of Interior, Fish and Wildlife Service. Handbook of Acute Toxicity of Chemicals to Fish and Aquatic Invertebrates. Resource Publication No. 137. Washington, DC: U.S. Government PrintingOffice, 1980. 49

15. LC50 FATHEAD MINNOW 2,800 UG/L/96 HR @ 17 DEG C (95% CONFIDENCE LIMIT 1,820-4,310 UG/L), WT 0.8 G /TECHNICAL MATERIAL, 95-98% STATIC BIOASSAY/ **PEER REVIEWED** [U.S. Department of Interior, Fish and Wildlife Service. Handbook of Acute Toxicity of Chemicals to Fish and Aquatic Invertebrates. Resource Publication No. 137. Washington, DC: U.S. Government PrintingOffice, 1980. 49
16. LC50 FATHEAD MINNOW 1,800 UG/L/96 HR @ 22 DEG C (95% CONFIDENCE LIMIT 1,200-2,700 UG/L), WT 0.2 G /LIQUID CONCN, 24%; STATIC BIOASSAY/ **PEER REVIEWED** [U.S. Department of Interior, Fish and Wildlife Service. Handbook of Acute Toxicity of Chemicals to Fish and Aquatic Invertebrates. Resource Publication No. 137. Washington, DC: U.S. Government PrintingOffice, 1980. 49

17. LC50 FATHEAD MINNOW 1,500 UG/L/96 HR @ 17 DEG C (95% CONFIDENCE LIMIT 890-2,540 UG/L), WT 0.8 G /LIQUID FORMULATION, 29%; STATIC BIOASSAY/ **PEER REVIEWED** [U.S. Department of Interior, Fish and Wildlife Service. Handbook of Acute Toxicity of Chemicals to Fish and Aquatic Invertebrates. Resource Publication No. 137. Washington, DC: U.S. Government PrintingOffice, 1980. 49
18. LC50 CHANNEL CATFISH 530 UG/L/96 HR @ 22 DEG C (95% CONFIDENCE LIMIT 375-748 UG/L), WT 1.0 G /TECHNICAL MATERIAL, 95-98%; STATIC BIOASSAY/ **PEER REVIEWED** [U.S. Department of Interior, Fish and Wildlife Service. Handbook of Acute Toxicity of Chemicals to Fish and Aquatic Invertebrates. Resource Publication No. 137. Washington, DC: U.S. Government PrintingOffice, 1980. 49
19. LC50 CHANNEL CATFISH 300 UG/L/96 HR @ 22 DEG C (95% CONFIDENCE LIMIT 200-430 UG/L), WT 0.5 G /LIQUID CONCN, 24%; STATIC BIOASSAY/ **PEER REVIEWED** [U.S. Department of Interior, Fish and Wildlife Service. Handbook of Acute Toxicity of Chemicals to Fish and Aquatic Invertebrates. Resource Publication No. 137. Washington, DC: U.S. Government PrintingOffice, 1980. 49
20. LC50 CHANNEL CATFISH 320 UG/L/96 HR @ 17 DEG C (95% CONFIDENCE LIMIT 275-371 UG/L), WT 0.8 G /LIQUID FORMULATION, 29%; STATIC BIOASSAY/ **PEER REVIEWED** [U.S. Department of Interior, Fish and Wildlife Service. Handbook of Acute Toxicity of Chemicals to Fish and Aquatic Invertebrates. Resource Publication No. 137. Washington, DC: U.S. Government PrintingOffice, 1980. 50
21. LC50 BLUEGILL 1,050 UG/L/96 HR @ 20 DEG C (95% CONFIDENCE LIMIT 859-1,280 UG/L), WT 0.9 G /TECHNICAL MATERIAL 95-98%; STATIC BIOASSAY/ **PEER REVIEWED** [U.S. Department of Interior, Fish and Wildlife Service. Handbook of Acute Toxicity of Chemicals to Fish and Aquatic Invertebrates. Resource Publication No. 137. Washington, DC: U.S. Government PrintingOffice, 1980. 49
22. LC50 BLUEGILL 710 UG/L/96 HR @ 20 DEG C (95% CONFIDENCE LIMIT 561-898 UG/L), WT 0.9 G /LIQUID CONCENTRATE, 24%; STATIC BIOASSAY/ **PEER REVIEWED** [U.S. Department of Interior, Fish and Wildlife Service. Handbook of Acute Toxicity of Chemicals to Fish and Aquatic Invertebrates. Resource Publication No. 137. Washington, DC: U.S. Government PrintingOffice, 1980. 49

23. LC50 BLUEGILL 670 UG/L/96 HR @ 17 DEG C (95% CONFIDENCE LIMIT 428-1,048 UG/L), WT 0.8 G /LIQUID FORMULATION, 29%; STATIC BIOASSAY/ **PEER REVIEWED** [U.S. Department of Interior, Fish and Wildlife Service. Handbook of Acute Toxicity of Chemicals to Fish and Aquatic Invertebrates. Resource Publication No. 137. Washington, DC: U.S. Government PrintingOffice, 1980. 50
24. LC50 GAMMARUS PSEUDOLIMNAEUS 1,050 UG/L/96 HR @ 12 DEG C HARD WATER (95% CONFIDENCE LIMIT 424-2,600 UG/L), MATURE /TECHNICAL MATERIAL 95-98%; STATIC BIOASSAY/ **PEER REVIEWED** [U.S. Department of Interior, Fish and Wildlife Service. Handbook of Acute Toxicity of Chemicals to Fish

and Aquatic Invertebrates. Resource Publication No. 137. Washington, DC: U.S. Government PrintingOffice, 1980. 49
25. LC50 LARGEMOUTH BASS 1,250 UG/L/96 HR (95% CONFIDENCE LIMIT 971-1,610 UG/L), WT 3.0 G /TECHNICAL MATERIAL, 95-98%; STATIC BIOASSAY/ **PEER REVIEWED** [U.S. Department of Interior, Fish and Wildlife Service. Handbook of Acute Toxicity of Chemicals to Fish and Aquatic Invertebrates. Resource Publication No. 137. Washington, DC: U.S. Government PrintingOffice, 1980. 49
26. LC50 LARGEMOUTH BASS 760 UG/L/96 HR @ 22 DEG C (95% CONFIDENCE LIMIT 589-979 UG/L), WT 3.0 G /LIQUID CONCENTRATE, 24%; STATIC BIOASSAY/ **PEER REVIEWED** [U.S. Department of Interior, Fish and Wildlife Service. Handbook of Acute Toxicity of Chemicals to Fish and Aquatic Invertebrates. Resource Publication No. 137. Washington, DC: U.S. Government PrintingOffice, 1980. 49
27. LC50 CHIRONOMUS 32 UG/L/48 HR @ 20 DEG C (95% CONFIDENCE LIMIT 13-80 UG/L), FOURTH INSTAR /LIQUID CONCENTRATE, 24%; STATIC BIOASSAY/ **PEER REVIEWED** [U.S. Department of Interior, Fish and Wildlife Service. Handbook of Acute Toxicity of Chemicals to Fish and Aquatic Invertebrates. Resource Publication No. 137. Washington, DC: U.S. Government PrintingOffice, 1980. 49
28. LC50 ATLANTIC SALMON 1,120 UG/L/96 HR @ 12 DEG C (95% CONFIDENCE LIMIT 930-1,350 UG/L), WT 0.5 G /TECHNICAL MATERIAL 95-98%; STATIC BIOASSAY/ **PEER REVIEWED** [U.S. Department of Interior, Fish and Wildlife Service. Handbook of Acute Toxicity of Chemicals to Fish and Aquatic Invertebrates. Resource Publication No. 137. Washington, DC: U.S. Government PrintingOffice, 1980. 49
29. LC50 ATLANTIC SALMON 1,400 UG/L/96 HR @ 12 DEG C (95% CONFIDENCE LIMIT 1,250-1,570 UG/L), WT 0.3 G /LIQUID CONCENTRATE, 24%; STATIC BIOASSAY/ **PEER REVIEWED** [U.S. Department of Interior, Fish and Wildlife Service. Handbook of Acute Toxicity of Chemicals to Fish and Aquatic Invertebrates. Resource Publication No. 137. Washington, DC: U.S. Government PrintingOffice, 1980. 49
30. LC50 ATLANTIC SALMON 1,200 UG/L/96 HR @ 12 DEG C (95% CONFIDENCE LIMIT 1,050-1,380 UG/L), WT 0.3 G /LIQUID FORMULATION, 29%; STATIC BIOASSAY/ **PEER REVIEWED** [U.S. Department of Interior, Fish and Wildlife Service. Handbook of Acute Toxicity of Chemicals to Fish and Aquatic Invertebrates. Resource Publication No. 137. Washington, DC: U.S. Government PrintingOffice, 1980. 49

31. LC50 BROOK TROUT 1,500 UG/L/96 HR @ 12 DEG C (95% CONFIDENCE LIMIT 1,230-1,830 UG/L), WT 1.2 G /TECHNICAL MATERIAL, 95-98%; STATIC BIOASSAY/ **PEER REVIEWED** [U.S. Department of Interior, Fish and Wildlife Service. Handbook of Acute Toxicity of Chemicals to Fish and Aquatic Invertebrates. Resource Publication No. 137. Washington, DC: U.S. Government PrintingOffice, 1980. 49
32. LC50 BROOK TROUT 2,200 UG/L/96 HR @ 12 DEG C (95% CONFIDENCE LIMIT 1,600-3,010 UG/L), WT 1.2 G /LIQUID CONCENTRATE, 24%; STATIC BIOASSAY/ **PEER REVIEWED** [U.S.

Department of Interior, Fish and Wildlife Service. Handbook of Acute Toxicity of Chemicals to Fish and Aquatic Invertebrates. Resource Publication No. 137. Washington, DC: U.S. Government PrintingOffice, 1980. 49
33. LC50 BROOK TROUT 1,220 UG/L/96 HR @ 12 DEG C (95% CONFIDENCE LIMIT 860-1,730 UG/L), WT 1.2 G /LIQUID FORMULATION, 29%; STATIC BIOASSAY/ **PEER REVIEWED** [U.S. Department of Interior, Fish and Wildlife Service. Handbook of Acute Toxicity of Chemicals to Fish and Aquatic Invertebrates. Resource Publication No. 137. Washington, DC: U.S. Government PrintingOffice, 1980. 49
34. LC50 SKWALA 34 UG/L/96 HR @ 7 DEG C (95% CONFIDENCE LIMIT 27-44 UG/L), NAIAD /TECHNICAL MATERIAL, 95-98%; STATIC BIOASSAY/ **PEER REVIEWED** [U.S. Department of Interior, Fish and Wildlife Service. Handbook of Acute Toxicity of Chemicals to Fish and Aquatic Invertebrates. Resource Publication No. 137. Washington, DC: U.S. Government PrintingOffice, 1980. 49
35. LC50 SKWALA 29 UG/L/96 HR @ 7 DEG C (95% CONFIDENCE LIMIT 21-41 UG/L), NAIAD /LIQUID CONCENTRATE, 24%; STATIC BIOASSAY/ **PEER REVIEWED** [U.S. Department of Interior, Fish and Wildlife Service. Handbook of Acute Toxicity of Chemicals to Fish and Aquatic Invertebrates. Resource Publication No. 137. Washington, DC: U.S. Government PrintingOffice, 1980. 49
36. LC50 Peking duck oral 1890 mg/kg/8 days **PEER REVIEWED** [Worthing, C.R., S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 7th ed. Lavenham, Suffolk, Great Britain: The Lavenham Press Limited, 1983. 363
37. LC50 Bobwhite quail oral 3680 mg/kg/8 days **PEER REVIEWED** [Worthing, C.R., S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 7th ed. Lavenham, Suffolk, Great Britain: The Lavenham Press Limited, 1983. 363
38. LC50 Coturnix japonica (Japanese quail) oral 3,436 ppm in 5 day diet ad libitum (95% confidence limit 1,992 to 5,928 ppm) /Technical grade/ **PEER REVIEWED** [Hill, E.F. and Camardese, M.B. Lethal Dietary Toxicities of Environmental Contaminants and Pesticides to Coturnix. Fish and Wildlife Technical Report 2.Washington, DC: United States Department of Interior Fish and Wildlife Service, 1986. 98
39. LC50 Pimephales promelas (fathead minnow) 2.11 mg/l/96 at 24.1 deg C, 6.6 mg/l dissolved oxygen, 50.5 mg/l CaCO3 water hardness, 38.4 mg/l CaCO3 alkalinity, pH 7.4, tank vol 1.2 l, tank additions 12 vol/day, (95% confidence limit 1.84-2.42 mg/l), flow-through bioassay, purity, 99%/

PEER REVIEWED [Geiger D.L., Call D.J., Brooke L.T. (eds)] Acute Toxicities of Organic Chemicals to Fathead Minnows (Pimephales Promelas). Vol. IV. Superior Wisconsin:University of Wisconsin-Superior, 1988. 71

Pharmacokinetics

Absorption, Distribution and Excretion:

1. EXPIRED AIR COLLECTED FOLLOWING ADMIN OF /LABELLED/ METHOMYL TO RATS CONTAINED LABELED CO2 & ACETONITRILE.

PEER REVIEWED [National Research Council. Drinking Water & Health Volume 1. Washington, DC: National Academy Press, 1977. 638

2. Following soil treatment, it is taken up by roots and translocated /in plants/. **PEER REVIEWED** [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987. 550

Metabolism/Metabolites:

1. (14)C-METHOMYL ... WAS BIOTRANSFORMED IN RATS INTO (14)CO2 (ABOUT 25%), ACETONITRILE (ABOUT 50%), & UNIDENTIFIED URINARY METABOLITES (ABOUT 25%). ABSENCE IN URINE OF PARENT OXIME & ... SULFOXIDE & SULFONE OF PARENT CMPD WAS CONFIRMED BY COMPARISON STUDIES WITH AUTHENTIC MATERIAL. **PEER REVIEWED** [The Chemical Society. Foreign Compound Metabolism in Mammals Volume 3. London: The Chemical Society, 1975. 393
2. ... METABOLISM OF METHOMYL IS PRIMARILY BY HYDROLYTIC ROUTE. PRINCIPAL METABOLITES FOUND IN URINE FOLLOWING TREATMENT OF RATS WITH (14)C-LABELED METHOMYL WERE OXIME-O-SULFATE, FREE OXIME, OXIME GLUCURONIDE ... . **PEER REVIEWED** [National Research Council. Drinking Water & Health Volume 1. Washington, DC: National Academy Press, 1977. 638
3. WHEN YOUNG CABBAGE PLANTS WERE TREATED FOLIARLY ... LESS THAN 3% ... REMAINED 1 WK AFTER TREATMENT. WHEN S-METHYL 1-(14)C-N-(METHYLCARBAMOYLOXY)THIOACETIMIDATE WAS USED OVER 20% OF LABEL /WAS EXPIRED/ (14)CO2 & 1-(14)C-ACETONITRILE. AFTER TOTAL DECOMPOSITION NO S-OXIDE OR S,S-DIOXIDE WAS DETECTED. **PEER REVIEWED** [Menzie, C. M. Metabolism of Pesticides, An Update. U.S. Department of the Interior, Fish, Wild-life Service, Special Scientific Report - Wildlife No. 184, Washington, DC: U.S. GovernmentPrinting Office, 1974. 253
4. RADIOLABELED METHOMYL ... APPLIED TO TOBACCO, CORN & CABBAGE. RAPID DEGRADATION OCCURRED TO CO2 & ACETONITRILE WITH METHOMYL HALF-LIFE OF 3-6 DAYS. LABELED LIPIDS, KREBS CYCLE ACIDS, SUGARS & OTHER MATERIALS WERE ALSO PRESENT. ... RADIOLABELED METHOMYL WAS INJECTED INTO 5TH-INSTAR CABBAGE LOOPERS (TRICHOPLUSIA NI). UNIDENTIFIED WATER SOL METABOLITES WERE FORMED. ACETONITRILE & OTHER VOLATILES ALSO PROBABLY FORMED. **PEER REVIEWED** [Menzie, C.M. Metabolism of Pesticides, Update II. U.S. Department of the Interior, Fish Wildlife Service, Special Scientific Report - Wildlife No. 212.Washington, DC: U.S. Government Printing Office, 1978. 184
5. Methomyl may exist in 2 geometric configurations. ... In the rat, methomyl labeled with (14)C at the imide carbon

was metabolized mainly to (14)C-CO2. By contrast the anti-isomer was metabolized predominately to acetonitrile. **PEER REVIEWED** [Hayes, Wayland J., Jr. Pesticides Studied in Man. Baltimore/London: Williams and Wilkins, 1982. 455

Mechanism of Action:

1. THE MODE OF ACTION ... IS INHIBITION OF ACETYLCHOLINESTERASE. **PEER REVIEWED** [National Research Council. Drinking Water & Health Volume 1. Washington, DC: National Academy Press, 1977. 643
2. THE INHIBITION OF CHOLINESTERASE BY METHOMYL IS QUICKLY REVERSED THROUGH VERY RAPID METABOLISM OF THE COMPOUND. IN DOGS GIVEN ONE-HALF THE LETHAL DOSE OF 20 MG/KG WITHOUT AN ANTIDOTE, SYMPTOMS OF INTOXICATION DISAPPEARED IN 2 HR & BLOOD CHOLINESTERASE LEVELS RETURNED TO NORMAL IN LESS THAN 4 HR. **PEER REVIEWED** [American Conference of Governmental Industrial Hygienists. Documentation of the Threshold Limit Values and Biological Exposure Indices. 5th ed. Cincinnati, OH:American Conference of Governmental Industrial Hygienists, 1986. 363

Interactions:

1. Combined effects of pesticides and ozone pollutants on pinto bean seedlings were examined. The insecticides diazinon and methomyl were applied to pinto bean seedlings at the recommended concentrations of 1 oz/3 gal water and 0.5 lb/100 gal water respectively. Both insecticides interacted with ozone applied at rates of 30 /part per hundred/ to produce /noteworthy/ alterations in foliar injury for the bean seedlings. **PEER REVIEWED** [Teso RR et al; Calif Agric 33 (4): 13 (1979)

ENVIRONMENTAL FATE/EXPOSURE POTENTIAL

Summary

Environmental Fate/Exposure Summary:

1. Methomyl is released into the environment primarily from its application to plants as an insecticide. If released to soil, methomyl will degrade primarily by microbial degradation with carbon dioxide as the principal end product; a lag period of one to two weeks may occur in unacclimated soils before biodegradation begins. A small degree of chemical hydrolysis may occur in moist soils. Methomyl may be susceptible to significant leaching. Field and greenhouse studies have shown that methomyl degrades rapidly in soil with half-lives of 14 days or less. If released to water, methomyl will hydrolyze at half-life rates of about 54, 38 and 20 weeks at pH's of 6.0, 7.0 and 8.0, respectively, at 25 deg C. Decomposition occurs more rapidly on aeration, in sunlight or with increased alkalinity. Methomyl may be susceptible to significant biodegradation in natural water as it has been shown to be readily biodegraded in soil. Aquatic volatilization, adsorption, and bioconcentration are not expected to be important. If released to the atmosphere, methomyl will react in the vapor-phase with photochemically produced hydroxyl radicals with an estimated half-life of 1.14 months. Direct photolysis may also contribute to its transformation in air. Methomyl adsorbed to particulates

in air are subject to physical removal via wet and dry deposition. Major general population exposure to methomyl will occur through consumption of contaminated food. Occupational exposure by dermal and inhalation routes

related to the use of methomyl as an insecticide may be significant. (SRC) **PEER REVIEWED**

Pollution Sources

Artificial Sources:

1. Methomyl is used as a foliar spray for the control of many insects on field crops, certain fruit crops, ornamentals and vegetables(1). It is released into the environment primarily and directly from its application as an insecticide(SRC). **PEER REVIEWED** [(1) Worthing CR, Walker SB; The Pest Manual Seventh Ed, Croydon, Eng The British Crop Protection Council (1983)

Environmental Fate

Environmental Fate:

1. ONE DOES NOT EXPECT TO FIND RESIDUES OF ... METHOMYL IN SOIL BEYOND GROWING SEASON DURING WHICH IT WAS APPLIED. VERY LITTLE DATA ON BEHAVIOR OF ALDICARB & METHOMYL IN WATER ARE AVAILABLE. IN STUDY OF POND & LAKE WATER, HALF-LIFE OF 5 DAYS & 6 DAYS WERE DETERMINED FOR ALDICARB & METHOMYL, RESPECTIVELY. **PEER REVIEWED** [National Research Council. Drinking Water & Health Volume 1. Washington, DC: National Academy Press, 1977. 637
2. IN SOIL, LABELED METHOMYL WAS DEGRADED TO (14)CO2 & OTHER MATERIALS, SOME OF WHICH WERE REINCORPORATED INTO NORMAL COMPONENTS OF SOIL ORG MATTER. **PEER REVIEWED** [Menzie, C.M. Metabolism of Pesticides, Update II. U.S. Department of the Interior, Fish Wildlife Service, Special Scientific Report - Wildlife No. 212.Washington, DC: U.S. Government Printing Office, 1978. 184
3. TERRESTRIAL FATE: Methomyl effectively controlled fall armyworm larvae in stands of Coastal Bermuda grass. Residues of methomyl declined rapidly with time after application, and by 7 days about 7% of the initial deposit remained regardless of the rate of application. Methomyl loss during dehydration in a natural gas dryer was approx 54%. The pelletizing process caused an additional loss of approx 14%. Thus, the total loss of methomyl during processing of green hay to pellets amounted to approx 68%. Losses of residues during air curing of hay in the field amounted to approx 37%. **PEER REVIEWED** [Sheets TJ et al; J Agric Food Chem 30 (3): 532-6 (1982)
4. TERRESTRIAL FATE: The adsorption of methomyl onto 3 greenhouse soils was measured and found to be weak to moderate. The transformation rates in 3 greenhouse soils were reasonably high with half-lives from about 3 to 14 days. These data were introduced into 2 computational models of pesticide behavior in simplified greenhouse systems. The computed leaching of methomyl ranged from nil to very small (0.03% of the dose), depending on the transformation rate and the amt of irrigation water. The concn measured by high performance liquid chromatography in drainage water from 3 greenhouses were somewhat higher than computed, although they remained less than 1 ug/l.

Various concn measured in water courses in an area with many greenhouses were distinctly higher than those

measured in drainage water, which may be the result of discharge of surpluses of spray liq into the water courses. **PEER REVIEWED** [Leistra M et al; Water, Air, Soil Pollut 23 (2): 155-67 (1984)

5. TERRESTRIAL FATE: Microbial degradation appears to be the major transformation process for methomyl in soil with carbon dioxide as the principal end product; a lag period of one to two weeks may occur in unacclimated soils before biodegradation begins. Some chemical hydrolysis of methomyl may also occur in moist soils. Methomyl may be susceptible to significant leaching; only slight leaching of methomyl was observed in a silt loam soil or sandy soil under field conditions but the degree of leaching may have been reduced by rapid degradation of the methomyl. Under field conditions, only 1.8% of applied methomyl remained in a Delaware soil after one month and no methomyl was detectable after 12 months; less than 0.005% of applied methomyl remained in a Florida field and in a North Carolina field after 3 and 5 months, respectively(1). In a soil treated with methomyl, only traces of parent compound, its oxime, and small polar fractions remained after one month(2). The half-life of methomyl in three greenhouse soils was found to range from 3 to 14 days(3). The half-life of methomyl on cotton plants has been found to range from 0.4 to 8.5 days; 0.8 to 1.2 days on mint plants, and approximately 2.5 days on Bermuda grass(4). **PEER REVIEWED** [(1) Harvey J Jr, Pease HL; J Agric Food Chem 21: 784 (1973) (2) Harvey J Jr; Environ Qual Saf, Suppl 3: 389 (1975) (3) Leistra M et al; Water, Air, Soil Pollut 23: 155 (1984) (4) Willis GH, McDowell LL; Rev Environ Contam Toxicol 100: 23-73 (1987)
6. AQUATIC FATE: The hydrolysis half-lives of methomyl in ethanol/water at pH's 6.0, 7.0 and 8.0 have been experimentally determined to be 54, 38 and 20 weeks, respectively, at 25 deg C. An experimental hydrolysis half-life of 262 days has been determined for methomyl in pure water at 25 deg C(2). Since methomyl absorbs UV light strongly at environmentally important wavelengths, direct photolysis is possible. Aqueous solutions of methomyl have been reported to decompose more rapidly on aeration, in sunlight or in alkaline media(1). Methomyl may be susceptible to significant biodegradation in natural water as it has been shown to be rapidly biodegraded in soil. Aquatic volatilization, adsorption and bioconcentration are not expected to be important (SRC). **PEER REVIEWED** [(1) Worthing CR, Walker SB; The Pest Manual Seventh Ed Croydon, Eng The British Crop Protection Council (1983) (2) Ellington JJ et al; Measurement of Hydrolysis Rate Constants for Evaluation of Hazardous Waste Land Disposal, Vol 3 USEPA 600/3-88/028 (1988)
7. ATMOSPHERIC FATE: Methomyl present in the atmosphere in the vapor-phase will react with photochemically produced hydroxyl radicals with an estimated half-life of 1.14 months. Direct photolysis may contribute to its removal

from the air. Due to its relatively low vapor pressure of 5X10-5 mm Hg at 25 deg C(1), a fraction of the methomyl present in the air in vapor-phase may become adsorbed to particulate matter which is subject to physical removal via wet and dry deposition(SRC). **PEER REVIEWED** [(1) Worthing CR, Walker SB; The Pest Manual Seventh Ed, Croydon, Eng; The British Crop Protection Council (1983)

8. TERRESTRIAL FATE: Decomposes rapidly in soil. **PEER REVIEWED** [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987. 550

Environmental Transformations

Biodegredation:

1. Methomyl seemed to be stable for about 16 days after application to an alluvial soil, but then degraded faster in the nonautoclaved alluvial soil as compared to autoclaved soil suggesting the importance of microbial degradation(1). Soil microorganisms were found to be the primary factor responsible for methomyl conversion in various soil types(2). Laboratory studies indicated that methyl radiolabeled methomyl was rapidly degraded in soil via microbial action with carbon dioxide as the principal end product(3). Microbial transformation of methomyl in two tobacco-growing soils was found to occur after a lag phase of 7-14 days, but occurred with virtually no lag phase in enriched soils; comparison with tests using sterlized conditions suggested that microbial transformation is likely to be the major factor in methomyl degradation in soil(4). **PEER REVIEWED** [(1) Aly MI et al; Alexandria J Agric Res 27: 689 (1979) (2) Heywood DL; Environ Qual Saf 4: 128 (1975) (3) Harvey J Jr, Pease HL; J Agric Food Chem 21: 784 (1973) (4) Fung KKH, Uren NC; J Agric Food Chem 25: 966 (1977)

Abiotic Degredation:

1. Methomyl exhibited hydrolysis half-lives of 56, 54, 38, and 20 weeks at pH's of 4.5, 6.0, 7.0, and 8.0, respectively, in sterile water-ethanol (99:1) at 25 deg C(1). A rate constant of 8.9X10-5 1/hr has been determined for the hydrolysis of methomyl in pure water at 25 deg C (pH=7), which translates to a half-life of 262 days(4). The photodegradative half-life for a thin film of methomyl exposed to laboratory lamps of environmentally important wavelengths was 48.41 hr(2). In acetonitrile solution, methomyl strongly absorbs UV light between 295 and 305 nm indicating a potential for direct photolysis in vapor and aqueous phase(2). The rate constant for the vapor-phase reaction of methomyl with photochemically produced hydroxyl radicals has been estimated to be 2.919X10-13 cu cm/molecule-sec at 25 deg C which corresponds to a half-life of 1.14 months assuming an average atmospheric concn of 8X10+5 hydroxyl radicals/cu cm(3). **PEER REVIEWED** [(1) Chapman RA, Cole CM; J Environ Sci Health B17: 487 (1982) (2) Chen ZM et al; Ind Eng Chem Prod Res Dev 23: 5 (1984) (3) GEMS; Graphical Exposure Modeling

System. FAP. Fate of Atmos Pollut (1986) (4) Ellington JJ et al; Measurement of Hydrolysis Rate Constants for Evaluation of Hazardous Waste Land Disposal, Vol 3 USEPA 600/3-88/028 (1988)

Environmental Transport

Bioconcentration:

1. Based on a log Kow of 0.60(1) and a water solubility of 58000 ppm at 25 deg C(2), the BCF values for methomyl are estimated to be 1.7 and 1.3, respectively(3, SRC) which indicates that bioconcentration is not significant(SRC). **PEER REVIEWED** [(1) Hansch C, Leo AJ; Medchem Project Issue No.26 Pomona College, Claremont, CA (1985) (2) Worthing CR, Walker SB; The Pest Manual Seventh Ed Croydon, Eng The British Crop Protection Council (1983) (3) Lyman WJ et al; Handbook of Chemical Property Estimation Methods. McGraw-Hill NY pp 5-4, 5-10 (1982)

Soil Adsorption/Mobility:

1. The adsorption of methomyl onto three greenhouse soils was found to be weak to moderate(1). Under field conditions, only slight leaching of methomyl was observed in a silt loam soil or in a sandy soil(2). An experimental Koc value of 160 was reported(3). Based on a log Kow of 0.60(4) and a water solubility of 58000 ppm at 25 deg C(5), the Koc for methomyl can be estimated to be 51 and 10, respectively(6,SRC). Koc values below 150 indicate high to very high soil mobility while Koc values between 150 and 500 indicate medium soil mobility(7). **PEER REVIEWED** [(1) Leistra M et al; Water, Air Soil Pollut 23: 155 (1984) (2) Harvey J Jr, Pease HL; J Agric Food Chem 21: 784 (1973) (3) Kenaga EE; Ecotox Env Safety 4: 24-38 (1980) (4) Hansch C, Leo AJ; Medchem Project Issue No.26 Pomona College, Claremont, CA (1985) (5) Worthing CR, Walker SB; The Pest Manual Seventh Ed, Croydon, Eng; The British Crop Protection Council (1983) (6) Lyman WJ et al; Handbook of Chemical Property Estimation Methods. McGraw-Hill NY p 4-9 (1982) (7) Swann RL et al; Res Rev 85: 17 (1983)

Volatilization from Water/Soil:

1. Based on a water solubility of 58000 ppm and a vapor pressure of 0.00005 mm Hg at 25 deg C(1), the Henry's Law constant for methomyl is estimated to be 1.8X10-10 atm-cu m/mole(SRC) which indicates that volatilization from water is not significant(2). **PEER REVIEWED** [(1) Worthing CR, Walker SB; The Pest Manual Seventh Ed Croydon, Eng; The British Crop Protection Council (1983) (2) Lyman WJ et al; Handbook of Chemical Property Estimation Methods. McGraw-Hill NY pp 15-15 to 15-17 (1982)

Environmental Concentrations

Atmospheric Concentrations:

1. The concn of methomyl detected in the ambient air of a storage room of a commercial pest control building was 13.7 ng/cu m over a 3 hr monitoring period(1). **PEER REVIEWED** [(1) Yeboah PO, Kilgore WW; Bull Environ Contam Toxicol 32: 629 (1984)

2. Concn detected in the gas phase were in the range of less than 1-7 ppb. Methomyl was present in the aerosol phase in the greenhouse air for 24 hr after spraying. **PEER REVIEWED** [Williams DT et al; Am Indust Hyg Assoc J 43 (3): 190-5 (1982)

Food Survey Results:

1. Methomyl was detected in 15 of 319 food samples analyzed between 1980 and 1983 at the following concn: cabbage, 0.02-0.41 ppm; cantaloupe, 0.02 ppm; cucumbers, 0.04 ppm; grapes, 0.01-0.04 ppm; lettuce, 0.12 ppm; romaine, 0.02 ppm; squash, 0.06 ppm; potatoes, below 0.01 ppm(1). One market basket from USA FDA's Total Diet Program for 1983 contained 0.07 ppm methomyl in boiled collards and 0.067 ppm methomyl in raw strawberries(1). Methomyl was found in 126 of 19,851 domestic and imported food and feed commodities obtained in Los Angeles, CA, 1982-86, at a concn of 0.05-2.0 ppm (4 samples at a concn >2 ppm)(2). This was further broken down into 121 of 6,391 domestic commodities and 5 of 12,044 imported commodities in the following foods: chinese peas, spinach and lettuce(3). **PEER REVIEWED** [(1) Krause RT; J Assoc Off Anal Chem 68: 734 (1985) (2) Luke MA et al; J Assoc Off Anal Chem 71: 415-20 (1988) (3) Hundley ET et al; J Assoc Off Anal Chem 71: 875-92 (1988)

Animal Concentrations:

1. Residues of methomyl (0.04-3.4 ppm) were found in dead Honey Bees taken from poisoned apiaries in CT, 1983-5(1). **PEER REVIEWED** [(1) Anderson JF, Wojtas, MA; J Econ Ent 79: 1200-5 (1986)

Human Exposure

Probable Routes of Human Exposure:

1. Major general population exposure to methomyl will occur through consumption of contaminated food. Inhalation of contaminated air, especially near areas of high usage of methomyl as an insecticidal spray, may also provide significant exposure. Occupational exposure by dermal and inhalation routes related to the use of methomyl as an insecticide may be significant. (SRC) **PEER REVIEWED**
2. THERE HAVE BEEN REPORTS OF OCCUPATIONAL EXPOSURE POISONINGS ... FROM METHOMYL WHEN ... INHALED BY WORKERS IN FORMULATING PLANTS. IT IS DIFFICULT ... TO EVALUATE SUCH POISONINGS, SINCE WORKERS ... ARE OCCUPATIONALLY EXPOSED ... TO ... ORGANOPHOSPHORUS INSECTICIDES AS WELL. ... NO CONTROLLED STUDIES. **PEER REVIEWED** [National Research Council. Drinking Water & Health Volume 1. Washington, DC: National Academy Press, 1977. 638
3. The concn of methomyl detected in the ambient air of a storage room of a commercial pest control building was 13.7 ng/cu m over a 3 hr monitoring period(1); conversion of this concn to a 40-hr work week is 0.180 ug/cu m which is far below the TLV-TWA value of 2500 ug/cu m(1). **PEER REVIEWED** [(1) Yeboah PO, Kilgore WW; Bull Environ Contam Toxicol 32: 629 (1984)
4. Concn detected in the gas phase were in the range of less

than 1-7 ppb. Methomyl was present in the aerosol phase in the greenhouse air for 24 hr after spraying. **PEER

REVIEWED** [Williams DT et al; Am Indust Hyg Assoc J 43 (3): 190-5 (1982)

Average Daily Intake:

1. The average daily intake of methomyl as determined by a market basket study conducted from April 1982 to April 1984 was as follows: 6-11 month olds 1.5 ng/kg body weight (bw)/day; 2 year olds 0.1 ng/kg bw/day; 14-16 year old females 1.3 ng/kg bw /day; 14- 16 year old males 1.2 ng/kg bw/day; 25-30 year old females 1.5 ng/kg bw/day; 25-30 year old males 0.9 ng/kg bw/day; 60-65 year old females 2.3 ng/kg bw/day; 60-65 year old males 2.1 ng/kg bw/day(1). **PEER REVIEWED** [(1) Gunderson EL; J Assoc Off Anal Chem 71: 1200-9 (1988)

EXPOSURE STANDARDS & REGULATIONS

Standards & Regulations

Acceptable Daily Intake:

1. FAO/WHO ADI: 0.03 mg/kg **QC REVIEWED** [FAO/WHO; Pesticide Residues in Food - 1990. Evaluations Part 1 - Residues p.424 Plant Prod Protect Paper 103/1 (1990)

Allowable Tolerances:

1. Tolerances are established for residues of the insecticide methomyl in or on raw agricultural commodities as follows: alfalfa: 10 ppm; apples: 1 ppm; asparagus: 2 ppm; avocados: 2 ppm; barley (forage): 10 ppm; barley (grain): 1 ppm; barley (hay): 10 ppm; barley (straw): 10 ppm; beans (dry): 0.1 ppm (negligible residues); beans (forage): 10 ppm; beans (succulent): 2 ppm; beets (tops): 6 ppm; blueberries: 6 ppm; broccoli: 3 ppm; brussel sprouts: 2 ppm; cabbage: 5 ppm; cauliflower: 2 ppm; celery: 3 ppm; chinese cabbage: 5 ppm; collards: 6 ppm; corn (fodder): 10 ppm; corn (forage): 10 ppm; corn (fresh, including sweet Kernel and corn with husk removed 0.1 ppm (negligible residues); corn (grain, including pop): 0.1 ppm (negligible residues); cottonseed: 0.1 ppm (negligible residues); cucurbits: 0.2 ppm (negligible residues); dandelions: 6 ppm; endive (escarole): 5 ppm; grapefruit: 2 ppm; grapes: 5 ppm; grass (Bermuda): 10 ppm; grass (Bermuda, hay, dried and dehydrated): 40 ppm; kale: 6 ppm; lemons: 2 ppm; lentils: 0.1 ppm; lettuce: 5 ppm; mint (hay): 2 ppm; mustard greens: 6 ppm; nectarines: 5 ppm; oats (forage): 10 ppm; oats (grain): 1 ppm; oats (hay): 10 ppm; oats (straw): 10 ppm; onions (green): 3 ppm; oranges: 2 ppm; parsley: 6 ppm; peaches: 5 ppm; peanuts: 0.1 ppm (negligible residues); peanuts (hulls): 0.1 ppm (negligible residues); peas: 5 ppm; peas (vines): 10 ppm; pecans: 0.1 ppm; peppers: 2 ppm; pomegranates: 0.2 ppm (negligible residues); rye (forage): 10 ppm; rye (grain): 1 ppm; rye (hay): 10 ppm; rye (straw): 10 ppm; sorghum (forage): 1 ppm; sorghum (grain): 0.2 ppm (negligible residues); soybeans: 0.2 ppm (negligible residues); soybeans (forage): 10 ppm; spinach: 6 ppm; strawberries: 2 ppm; swiss chard: 6 ppm; tangerines: 2 ppm; tomatoes: 1

ppm; turnip greens (tops): 6 ppm; vegetable (fruiting): 0.2 ppm (negligible residues); vegetables, leafy except for beets (tops), broccoli, brussel sprouts, cabbage, cauliflower, celery, Chinese cabbage, collards,

dandelions, endive (escarole), kale, lettuce, mustard greens, parsley, Swiss chard, turnip greens (tops), and watercress: 0.2 ppm (negligible residues); vegetables (root crop): 0.2 ppm (negligible residues); watercress: 6 ppm; wheat (forage): 10 ppm; wheat (grain): 1 ppm; wheat (hay): 10 ppm; wheat (straw): 10 ppm. **PEER REVIEWED** [40 CFR 180.253(a) (7/1/88)

2. Tolerances with regional registration ... are established for residues of methomyl in or on the following raw agricultural commodity: Pears: 4ppm. **PEER REVIEWED** [40 CFR 180.253(b) (7/1/88)
3. A food additive tolerance of 7 ppm is established until Jan 12, 1990, for residues of the insecticide methomyl (s-methyl-N-[(methylcarbomyl)oxy] thioacetimidate) in or on the processed commodity dried hops as a result of application to the growing hops. **PEER REVIEWED** [40 CFR 185.4100 (7/1/88
4. Tolerances with regional registration are established for residues of methomyl in or on pears. **PEER REVIEWED** [40 CFR 180.253(b) (7/1/88)

Occupational Permissible Levels

OSHA Standards:

1. 8 hr Time-Weighted avg: 2.5 mg/cu m. **PEER REVIEWED** [54 FR 2920 (1/19/89)
2. Meets criteria for OSHA medical records rule. **PEER REVIEWED** [29 CFR 1910.20 (7/1/88)

NIOSH Recommendations:

1. 10 hr Time-Weighted avg: 2.5 mg/cu m. **QC REVIEWED** [NIOSH. NIOSH Pocket Guide to Chemical Hazards. DHHS (NIOSH) Publication No. 94-116. Washington, D.C.: U.S. Government Printing Office, June 1994. 194

Threshold Limit Values:

1. 8 hr Time Weighted Avg (TWA) 2.5 mg/cu m (1977) **QC REVIEWED** [American Conference of Governmental Industrial Hygienists. Threshold Limit Values (TLVs) for Chemical Substances and Physical Agents and BiologicalExposure Indices (BEIs) for 1995-1996. Cincinnati, OH: ACGIH, 1995. 25
2. Excursion Limit Recommendation: Excursions in worker exposure levels may exceed three times the TLV-TWA for no more than a total of 30 min during a work day, and under no circumstances should they exceed five times the TLV-TWA, provided that the TLV-TWA is not exceeded. **QC REVIEWED** [American Conference of Governmental Industrial Hygienists. Threshold Limit Values (TLVs) for Chemical Substances and Physical Agents and BiologicalExposure Indices (BEIs) for 1995-1996. Cincinnati, OH: ACGIH, 1995. 5
3. BEI (Biological Exposure Index): Cholinesterase activity in red cells (timing is discretionary) is 70% of

individual's baseline. The determinant is usually present in a significant amt in biological specimens collected from subjects who have not been occupationally exposed. Such background levels are incl in the BEI value. The determinant is nonspecific, since it is observed after exposure to some other chemicals. These nonspecific tests

are preferred because they are easy to use and usually offer a better correlation with exposure than specific tests. In such instances, a BEI for a specific, less quantitative biological determinant is recommended as a confirmatory test. The biological determinant is an indicator of exposure to the chemical, but the quantitative interpretation of the measurements is ambiguous. (1989-90 adoption) /Organophosphorus cholinesterase inhibitors/ **QC REVIEWED** [American Conference of Governmental Industrial Hygienists. Threshold Limit Values (TLVs) for Chemical Substances and Physical Agents and BiologicalExposure Indices (BEIs) for 1995-1996. Cincinnati, OH: ACGIH, 1995. 65

Other Standards and Regulations

CERCLA Reportable Quantities:

1. Persons in charge of vessels or facilities are required to notify the National Response Center (NRC) immediately, when there is a release of this designated hazardous substance, in an amount equal to or greater than its reportable quantity of 100 lb or 45.4 kg. The toll free number of the NRC is (800) 424-8802; In the Washington D.C. metropolitan area (202) 426-2675. The rule for determining when notification is required is stated in 40 CFR 302.4 (section IV. D.3.b). **PEER REVIEWED** [54 FR 33419 (8/14/89)

Federal Drinking Water Guidelines

1. EPA 200 ug/l [USEPA/Office of Water; Federal-State Toxicology and Risk Analysis Committee (FSTRAC). Summary of State and Federal Drinking Water Standards and Guidelines (11/93)

State Drinking Water Guidelines

1. (AZ) ARIZONA 180 ug/l [USEPA/Office of Water; Federal-State Toxicology and Risk Analysis Committee (FSTRAC). Summary of State and Federal Drinking Water Standards and Guidelines (11/93)
2. (ME) MAINE 50 ug/l [USEPA/Office of Water; Federal-State Toxicology and Risk Analysis Committee (FSTRAC). Summary of State and Federal Drinking Water Standards and Guidelines (11/93)
3. (MN) MINNESOTA 200 ug/l [USEPA/Office of Water; Federal-State Toxicology and Risk Analysis Committee (FSTRAC). Summary of State and Federal Drinking Water Standards and Guidelines (11/93)

RCRA Requirements:

1. As stipulated in 40 CFR 261.33, when methomyl, as a commercial chemical product or manufacturing chemical intermediate or an off-specification commercial chemical product or a manufacturing chemical intermediate, becomes

a waste, it must be managed according to federal and/or state hazardous waste regulations. Also defined as a hazardous waste is any container or inner liner used to hold this waste or any residue, contaminated soil, water, or other debris resulting from the cleanup of a spill, into water or on dry land, of this waste. Generators of small quantities of this waste may qualify for partial exclusion from hazardous waste regulations (40 CFR

261.5(e)). **PEER REVIEWED** [40 CFR 261.33 (7/1/88)

FIFRA Requirements:

1. Tolerances are established for residues of the insecticide methomyl in or on certain raw agricultural commodities. **PEER REVIEWED** [40 CFR 180.253(a) (7/1/88)
2. Tolerances with regional registration are established for residues of methomyl in or on pears. **PEER REVIEWED** [40 CFR 180.253(b) (7/1/88)
3. Classified for restricted use, limited to use by or under the direct supervision of a certified applicator. Based on residue effects on mammalian species & accident history the following are restricted from nondomestic outdoors-agricultural crops, ornamental & turf use as well as all other registered uses: Formulations containing methomyl as sole active ingredient in 1% to 2.5% baits (except 1% fly bait); all concentrated solution formulations; 90% wettable powder formulations (not in water soluble bags); 90% wettable powder formulation in water sol bags; all granular formulations; 25% wettable powder formulations; and in 1.24% to 2.5% dusts as sole active ingredient and in mixtures with fungicides and chlorinated hydrocarbon, inorganic phosphate and biological insecticides based on residue effects on mammalian species and accident history. **PEER REVIEWED** [40 CFR 152.175 (7/1/88)
4. Pesticide chemicals that cause related pharmacological effects will be regarded, in the absence of evidence to the contrary, as having an additive deleterious action. Many pesticide chemicals within the following groups have related pharmacological effects: chlorinated organic pesticides, arsenic-containing chemicals, metallic dithiocarbamates, and cholinesterase-inhibiting pesticides. Where residues from two or more chemicals in the same class are present in or on a raw agricultural commodity the tolerance for the total of such residues shall be the same as that for the chemical having the lowest numerical tolerance in this class, unless a higher tolerance level is specifically provided for the combined residues by a regulation in this part. Methomyl is a member of the class of cholinesterase inhibiting pesticides. **PEER REVIEWED** [40 CFR 180.3(e) (7/1/88)
5. A food additive tolerance of 7 ppm is established until Jan 12, 1990, for residues of the insecticide methomyl (s-methyl-N-[(methylcarbomyl)oxy]thioacetimidate) in or on the processed commodity dried hops as a result of application to the growing hops. **PEER REVIEWED** [40 CFR

185.4100 (7/1/88

6. Classified for restricted use, limited to use by or under the direct supervision of a certified applicator. **PEER REVIEWED** [40 CFR 152.175 (7/1/88)

FDA Requirements:

1. A food additive tolerance is established until January 12, 1990, for residues of the insecticide methomyl in or on the processed commodity dried hops as a result of application to the growing hops. **PEER REVIEWED** [21 CFR 193.475 (4/1/88)

MONITORING AND ANALYSIS METHODS

Analytic Laboratory Methods:

1. RESIDUES ARE DETERMINED BY ... GAS LIQUID CHROMATOGRAPHY (HL PEASE & JJ KIRKLAND J AGRIC FOOD CHEM, 1968, 16, 554; IH WILLIAMS, PESTIC SCI, 1972, 3, 179). USE OF FLAME PHOTOMETRIC DETECTOR INSTEAD OF SULFUR MICROCOULOMETRIC DETECTOR GIVES IMPROVED RESULTS (DETAILS AVAILABLE FROM EI DU PONT DE NEMOURS & CO (INC). **PEER REVIEWED** [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987. 550
2. A REVERSE PHASE HIGH PRESSURE LIQUID CHROMATOGRAPHIC METHOD IS PRESENTED FOR THE SEPARATION & DETERMINATION OF RESIDUES OF METHOMYL ON VEGETABLES. **PEER REVIEWED** [THEAN JE ET AL; J ASSOC OFF ANAL CHEM 61 (1): 15-7 (1978)
3. Determination of six N-methylcarbamates incl methomyl in vegetables and fruits by high performance liq chromatography is described. **PEER REVIEWED** [Ting KC et al; Bull Environ Contam Toxicol 33 (5): 538-47 (1984)
4. Determination of N-methylcarbamate pesticides, incl methomyl, in well water by liq chromatography with post-column fluorescence derivatization is described. Mean recoveries for all 9 substances at the approx concn of 8 and 40 ppb are in excess of 95%. **PEER REVIEWED** [Hill KM et al; Anal Chem 56 (13): 2465-8 (1984)
5. A simple and specific method of determining methomyl residues in selected vegetables, grains, and soil is described. The method is based on the modification of a qualitative test for aldoxime and ketoxime methomyl is converted to oxime and hydroxylamine by alkali and acid treatment. An amount of 0.625 ppm methomyl can be determined in a 40 g sample of selected vegetables, grains, and soils. **PEER REVIEWED** [Rangaswamy JR et al; Assoc Off Anal Chem J 60 (5): 1093 (1977)
6. The procedures on the residual analysis of pesticides, DMTP (methidathion), isoxathion, methomyl, PAP (phenthoate), phosalone, and TPN (chlorothalonil) were simplified by some modifications. Basic lead acetate solutions added to tea infusion to precipitate polyphenols and saponins as lead complexes. These lead complexes were filtered through a filter paper piled with some celite, and washed with 50 ml of acetone and then 100 ml of n-hexane. The remnant /of methomyl/ was washed with 50 ml of ethanol. From the resulting aqueous layer, chemicals,

except methomyl, were extracted with n-hexane and cleaned up by column chromatography. **PEER REVIEWED** [Onoda Y, Imamura M; J Pest Sci 5 (1): 101-5 (1980)
7. Methomyl concn levels were monitored before, during and for 24 hr after the spraying of aq soln of the insecticide in a commercial greenhouse containing roses. All measurements were made in real-time using a mobile atmospheric pressure chem ionization mass spectrometer system. **PEER REVIEWED** [Williams DT et al; Am Indust Hyg Assoc J 43 (3): 190-5 (1982)
8. A liquid chromatographic method using a two step purification technique for the simultaneous determination

of 10 carbamates (including aldicarb, methomyl, methiocarb, and carbofuran) in bovine, swine, and duck livers was developed. Carbamates were extracted from liver samples with methylene chloride. After evaporation, the residues from the extract were dissolved in methylene chloride-cyclohexane (1 + 1) and cleaned up by gel permeation chromatography. The eluate containing carbamate residues was evaporated to dryness, reconstituted in methylene chloride, further purified by passing it through an aminopropyl Bond Elut extraction cartridge, and analyzed by liquid chromatography using post-column derivatization with o-phthalaldehyde and fluorescence detection. Excitation and emission were set at 340 and 418 nm, respectively. Liver samples for beef, pork, and duck were fortified with 5, 10, or 20 ppb of mixed carbamate standards. The avg of 10 recoveries of 10 carbamates at all 3 levels of fortification was greater than 80% with coefficients of variation less than 17%. **PEER REVIEWED** [Ali MS; J Assoc Off Anal Chem 72 (4): 586-92 (1989)

Clinical Laboratory Methods:

1. A chemical ionization mass fragmentography method for determination of methomyl in biological samples was used to detect a peak concn of 1.61 ug/g in the blood of a female subject 6 hr after ingestion of 2.25 g. **PEER REVIEWED** [Noda J; Nippon Hoigaku Zasshi 38 (1): 71-82 (1984)
2. A thin-layer chromatographic method with flame-ionization for the quantitative evaluation of methomyl (S-methyl N-(methylcarbamoyl)oxy)thioacetimidate) in serum and urine is described. Methomyl in biological fluids was separated and purified simply and rapidly by passing the samples through a Sep Pak C-18 silica cartridge, in contrast to the complicated pretreatment required in conventional methods. The detection limit was 0.07 ug in the spotted volume using Chromarod A with acetone-hexane (1:4, v/v) as the solvent system. The recoveries were 104.0% in serum, and 98.5% in urine. Further, the method showed good precision; the coefficient of variation was 2.4% in serum, and 4.0% in urine. The reproducibility was satisfactory and this method could be performed far more simply and rapidly than the conventional ones. **PEER REVIEWED** [Ikebuchi J et al; J Hyg Chem 31 (2): 141-4 (1985)

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ET CONTENTS 4 LITRES

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EST
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COMMERCIAL
PREMISE
DISINFECTANT
TAMED IODINE

TAMED IODINE LIQUID DISINFECTANT

or cleaning, disinfecting, and sanitizing animal housing and quipment; for sanitizing poultry drinking water; for isinfecting poultry crates, trucks and livestock trucks; for use s a shoe bath prior to entering barns and poultry houses; for se as a deodorant; for sanitizing food-processing equipment.
REMISE DISINFECTANT is not adversely affected by water hardness r low-temperature water.
REMISE DISINFECTANT has its built-in indicator of germicidal ctivity. (When the amber colour disappears, a fresh solution hould be prepared).

UARANTEE: Nonylphenoxypolyethoxyethanol iodine complex
(Providing 1.75% titratable iodine).....18.05%
Phosphoric Acid.....16.00%

EGISTRATION NO. 12557 PEST CONTROL PRODUCTS ACT
ATENTED 1964, 1974
IN 564338

DANGER CORROSIVE
READ THE LABEL BEFORE USING

EST
W*

Manufactured by:
WEST CHEMICAL PRODUCTS OF CANADA LTD.
FOOD DIVISION
10900 SECANT, VILLE D'ANJOU, P.Q. H1J 1S5

IRECTIONS FOR USE:
SANITIZING POULTRY DRINKING WATER:
Add 4 mL of PREMISE DISINFECTANT to 10 litres of drinking water. Provides 8 ppm of iodine in drinking water.
FOOD PLANT SANITATION:
Use 30 mL of PREMISE DISINFECTANT (25 ppm) in each 20 litres of water as the final sanitizing rinse on previously cleaned food processing equipment and utensils.
SHOE BATH:
To help prevent tracking disease organisms into poultry houses and hog barns, place a shoe bath inside the doorway, containing 30 mL of PREMISE DISINFECTANT per 2 litres of water. After scraping shoes outside doorway, stand in shoe bath for 30 seconds prior to entering building interior. Change shoe bath daily.
CLEANING AND DISINFECTING BUILDINGS, POULTRY CRATES, TRUCKS AND LIVESTOCK TRUCKS, AND EQUIPMENT ON THE FARM.
Before proceeding as indicated below, remove all animals and feeds from the premises, cars, boats, trucks, and other equipment. Remove all litter and manure from floors, walls, and surfaces of barns, pens, stalls, chutes, and other facilities and fixtures occupied or traversed by animals. Empty all troughs, tracks and other feeding and watering appliances, saturating all surfaces with PREMISE DISINFECTANT solution (22 mL to 5 litres of water). Immerse all halters, ropes and other types of equipment used in handling and restraining animals, as well as forks, shovels, and scrapers. Ventilate buildings, cars, boats, and other closed spaces. Do not house livestock or employ equipment until treatment has been absorbed, set or dried. Then, clean and

disinfect in one easy step with PREMISE DISINFECTANT. Use 22 mL of PREMISE DISINFECTANT per 5 litres of water. Scrub surfaces to be cleaned and disinfected with a good brush or with a power sprayer. Start at the highest point of the building or equipment being cleaned, and work down. Let solution drain dry without rinsing. All treated feed racks, mangers, troughs, automatic feeders, fountains and waterers must be thoroughly rinsed with potable (drinking) water prior to reuse.

SAFETY MEASURES:

DANGER: KEEP OUT OF REACH OF CHILDREN. Causes eye damage and skin irritation. Do not get into eyes, on skin or on clothing. Protect eyes and skin when handling. Rubber gloves and goggles should be used for protection. Harmful if swallowed. Avoid contamination of food.

FIRST AID: in case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. For eyes, call a physician. Remove and wash contaminated clothing before reuse. If swallowed, promptly drink a large quantity of milk, egg whites, gelatin solution, or if these are not available, drink large quantities of water. Call a physician immediately.

NOTE TO PHYSICIAN: Probable mucosal damage may contraindicate the use of gastric lavage. Measure against circulatory shock, respiratory depression and convulsions may be needed.

NOTICE TO USER:

This control product is to be used only in accordance with the directions on this label. It is an offence under the Pest Control Products Act to use a control product under unsafe conditions.

Do not store in food processing or food storage areas.

RINSE EMPTY CONTAINER THOROUGHLY WITH WATER AND DISCARD IT.

8504-4L-A088

MANUFACTURED IN CANADA

LOT: *Registered Trade Mark. Authorized User.

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* *
* REGULATORY INFORMATION ON PESTICIDE PRODUCTS *
*
* Produced by : Agriculture and Agri-Food Canada *
* Provided by : Canadian Centre for Occupational Health and Safety *
* Issue : 96-4 (November, 1996) *

*** IDENTIFICATION ***

REGISTRATION NUMBER : 18969.00
PRODUCT NAME : DISVAP 50 WETTABLE POWDER POULTRY & LIVESTOCK PREMISE SPRAY

:GISTRANT : DISPAR, DIV.VETOQUINOL CANADA (CODE: DIS)
675 ST-PIERRE SUD
JOLIETTE QC
J6E 3Z1
TEL : 514-759-0497

*** REGISTRATION DATA ***

EGULATORY STATUS : REGISTERED
ATE OF FIRST REGISTRATION : 1986.02.27
:ETHOD OF APPLICATION : RESIDUAL SPRAY (STRUCTURAL PEST CONTROL)
.OCATION OF USE : FARM BUILDINGS
NONCROP LAND
OUTDOOR LIVING AREAS
1ARKETING TYPE : COMMERCIAL
?RODUCT GROUP : ARTHROPOD AND MOLLUSC CONTROLS
?RODUCT TYPE : ACARICIDE
INSECTICIDE
FORMULATION TYPE : WETTABLE POWDER
AERIAL APPLICATION : UNSPECIFIED
ANTIMICROBIAL/TRADITIONAL GROUP : TRADITIONAL
YEAR OF NEXT RE-REGISTRATION : 1995

*** ACTIVE INGREDIENTS ***

INGREDIENT NAME :
TETRACHLORVINPHOS (CODE: GAR)
GUARANTEED CONTENT : 50 %
CHEMICAL NAME :
(Z)-2-CHLORO-1-(2,4,5-TRICHLOROPHENYL)VINYL DIMETHYL PHOSPHATE
CAS REGISTRY NUMBER : 961-11-5
LABEL AVAILABILITY : English Label available

*** LABEL TEXT ***

92.05.11

DISPAR
DISVAP 50
POUDRE MOUILLABLE
WETTABLE POWDER
POUDRE MOUILLABLE A PULVERISER POUR TRAITER LA VOLAILLE ET LES BATIMENTS POUR BETAIL
POULTRY AND LIVESTOCK SPRAY
AGRICOLE / AGRICULTURAL
GARANTIE / GUARANTEE:
50% P/P , W/W TETRACHLORVINPHOS
LIRE L'ETIQUETTE AVANT L'EMPLOI
READ LABEL BEFORE USING
REGISTRATION NO. 18969 PEST CONTROL PRODUCTS ACT
NO. D'HOMOLOGATION 18969 DE LA LOI SUR LES PRODUITS ANTIPARASITAIRES
NET WEIGHT / POIDS NET : 2 Kg
ATTENTION / CAUTION
POISON
PRODUITS VETERINAIRES DISPAR LTEE
DISPAR VETERINARY PRODUCTS LTD
JOLIETTE, QUE, J6E 3Z1

GENERAL DIRECTIONS

DISVAP 50 WP is suitable for use in conventional powder or low pressure knapsack sprayers. Occasional agitation is recommended to prevent undue settling of the suspension. Follow the directions for use for the proper method for a specific insect and areas or types of wall surfaces. Refer to DILUTION TABLE for the quantity of insecticide needed to make the recommended percent solution.

INSECT	TYPE OF HOUSING	%SOLUTION	REMARKS
LICE AND MITES	WIRED CAGES	0.5%	APPLY DIRECTLY TO BIRDS (4 LITRES/100 BIRDS). SPRAY VENT AND FLUFF AREAS FROM BELOW. REPEAT WHEN NECESSARY. DO NOT REPEAT MORE THAN EVERY 14 DAYS. FOR INDIVIDUAL BIRD TREATMENT, APPLY 30 mL OF THE MIXTURE PER BIRD. NOTE: FOR MAXIMUM LASTING CONTROL OF THE NORTHERN FOWL MITE, PENETRATION OF THE FEATHERS AROUND THE VENT AREA IS ABSOLUTELY ESSENTIAL. USE POWDER SPRAYER AT 7-9 kg/SQ cm AT NO LESS THAN RECOMMENDED PRESSURE. MORE ATTENTION MUST BE GIVEN TO EACH INDIVIDUAL BIRD WHEN USING LOW-PRESSURE EQUIPMENT. TREAT ROOSTER CAREFULLY AND THOROUGHLY TO AVOID REINFESTATION IN BREEDING FLOCKS.
	FLOOR MANAGEMENT DUST BOX	50%W.P.	MIX EVENLY THROUGHOUT TOP LAYER OF BOX CONTENTS USING 150 g/100 BIRDS
LICE, MITES & LESSER MEALWORMS	FLOOR MANAGEMENT ROOST PAINT	1.0%	TREAT WITH BRUSH OR SPRAY THOROUGHLY, PARTICULARLY CRACKS AND CREVICES USING 145-185 mL/10m.
	FLOOR MANAGEMENT LITTER	1.0%	APPLY 1-4 LITRES/100 SQ. m EVENLY FOR PENETRATION INTO LITTER SURFACE. ALSO APPLY THOROUGHLY TO WALLS, ROOST, CRACKS, CREVICES AND INTERIORS. SPRAY BIRDS LIGHTLY.
	FLOOR MANAGEMENT LITTER	50% W.P.	TREAT EVENLY AND THOROUGHLY USING 75g/10 SQ. m. USE A ROTARY OR MECHANICAL DUSTER (WEAR A DUST MASK DURING THIS OPERATION).
FOWL TICK	ALL TYPES	1.0%	APPLY 3-4 LITRES/10 SQ. m THOROUGHLY TO WALLS, CEILING, FLOOR CRACKS AND CREVICES WITH A POWER SPRAYER.

PREMISE USE DIRECTIONS

INSECT	PROBLEM AREAS	% SOLUTION	REMARKS

FLIES	DAIRY BARNS, POULTRY HOUSES, SWINE BARNS OTHER LIVESTOCK BUILDINGS	2.0%	FOR DRY WHITEWASHED WOOD OR CONCRETE BLOCKS - 8 LITRES OF SOLUTION/ 100 SQ. M
		1.0%	FOR UNPAINTED WOOD OR PAINTED CONCRETE BLOCKS - 8 LITRES OF SOLUTION/100 SQ. m
		1.0%	FOR MASONITE OR GALVANIZED SHEET METAL - 4 LITRES OF SOLUTION/100 SQ. m
MAGGOTS	PULTRY DROPPINGS MANURE OR GARBAGE PILES UNDER FEED TROUGHS	1.0%	APPLY 4 LITRES OF SOLUTION/10 SQ. m PENETRATE PROBLEM AREA FIRST TIME- REPEAT EVERY 7-10 DAYS THEREAFTER.
TICKS	CAMPGROUNDS BACKYARDS, PICNIC AREAS RECREATIONAL PARKS, OTHER OUTDOOR LIVING AREAS.	0.5%	SPRAY INFESTED AREAS THOROUGHLY (APPROXIMATELY 100 LITRES OF SOLUTION/ 2.5 HECTARES). SPRAY ALONG FOOT PATHS AND ROADSIDES LEADING TO SUCH AREAS.

DILUTION TABLE

AMOUNT OF DISVAP 50% WP (WETTABLE POWDER)	AMOUNT OF WATER FOR SOLUTION		
	0.5%	1%	2%
250 g	25 litres	12.5 litres	5.25 litres
1 kg	100 litres	50 litres	25 litres
2 kg	200 litres	100 litres	50 litres
4 kg	400 litres	200 litres	100 litres

PRECAUTIONS:

KEEP OUT OF REACH OF CHILDREN AND LIVESTOCK. Harmful if swallowed or absorbed through skin. Avoid breathing spray mist and dust. Do not get in eyes, on skin or clothing. Wash thoroughly with soap and water after handling and before eating or smoking. Avoid contamination of feed and foodstuffs. Toxic to fish. Do not contaminate water by disposal of waste. Do not re-use empty container.

NOTICE TO USER:

This control product is to be used only in accordance with the directions on this label. It is an offence under the Pest Control Products Act to use a control product under unsafe conditions.

LIMITATION OF WARRANTY:

Seller's guarantee shall be limited to the terms set out on the label and subject thereto. The buyer assumes the risk to persons or property arising from the use or handling of this product and accepts the product on that condition.

FIRST AID:

Do not induce vomiting or give anything by mouth to an unconscious person. If ingested, drink 1 or 2 glasses of water

and induce vomiting by touching back of the throat with finger. Repeat until fluid is clear. Call a physician immediately. If inhaled: Remove victim to fresh air. Resuscitate as necessary. If on skin: Remove contaminated clothing and wash affected area with soap and water. If in eyes: Flush eyes with water for 15 minutes. Call a physician if irritation persists.
TOXICOLOGICAL INFORMATION: Tetrachlorvinphos is of the organophosphate family and is a cholinesterase inhibitor. Atropine is administered intravenously in doses of 1-2 mg, at 10 minute intervals, is the drug of choice for treating cases of intoxication.
DISPOSAL:Thoroughly empty the container into the application device. Make the empty container unsuitable for further use. Dispose of the container in accordance with provincial requirements. For information on the disposal of unused, unwanted product and the cleanup of spills, contact the regional office of Environmental Protection, Environment Canada.
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* REGULATORY INFORMATION ON PESTICIDE PRODUCTS *
* *
* Produced by : Agriculture and Agri-Food Canada *
* Provided by : Canadian Centre for Occupational Health and Safety *
* Issue : 96-4 (November, 1996) *

*** IDENTIFICATION ***

REGISTRATION NUMBER	: 19234.01
PRODUCT NAME	: BANDIT LONG ACTING PREMISE SPRAY
REGISTRANT	: ANIMAX (CODE: AMX) 383 SOVEREIGN RD LONDON ON N6M 1A3 TEL : 519-453-3384

*** REGISTRATION DATA ***

REGULATORY STATUS	: HISTORICAL
DATE OF FIRST REGISTRATION	: 1987.05.25
DATE OF LAST REGISTRATION	: 90.12.31
METHOD OF APPLICATION	: RESIDUAL SPRAY (STRUCTURAL PEST CONTROL)
LOCATION OF USE	: DWELLINGS
MARKETING TYPE	: DOMESTIC
PRODUCT GROUP	: ARTHROPOD AND MOLLUSC CONTROLS
PRODUCT TYPE	: INSECTICIDE
FORMULATION TYPE	: PRESSURIZED PRODUCT

AERIAL APPLICATION : UNSPECIFIED
ANTIMICROBIAL/TRADITIONAL GROUP : TRADITIONAL
REASON FOR DISAPPEARANCE : DISCONTINUED BY REGISTRANT

*** ACTIVE INGREDIENTS ***

INGREDIENT NAME :
PROPOXUR (CODE: BAY)
GUARANTEED CONTENT : 0.500 %
CHEMICAL NAME :
2-ISOPROPOXYPHENYL METHYLCARBAMATE
CAS REGISTRY NUMBER : 114-26-1

INGREDIENT NAME :
N-OCTYL BICYCLOHEPTENE DICARBOXIMIDE (CODE: MGK)
GUARANTEED CONTENT : 0.166 %
CHEMICAL NAME :
N-(2-ETHYLHEXYL)BICYCLO(2,2,1)-5-HEPTENE-2,3-DICARBOXIMIDE
CAS REGISTRY NUMBER : 113-48-4

INGREDIENT NAME :
PIPERONYL BUTOXIDE (CODE: PBU)
GUARANTEED CONTENT : 0.100 %
CHEMICAL NAME :
5-[2-(2-BUTOXYETHOXY)ETHOXYMETHYL]-6-PROPYL-1,3-BENZODIOXOLE
CAS REGISTRY NUMBER : 51-03-6

INGREDIENT NAME :
PYRETHRINS (CODE: PYR)
GUARANTEED CONTENT : 0.050 %
CHEMICAL NAME :
2,2-DIMETHYL-3-(2-METHYLPROPENYL) CYCLOPROPANECARBOXYLIC ACID ESTER WITH 4-HYDROXY-3-METHYL-2-(2,4-PENTADIENYL)-2-CYCLOPENTEN-1-ONE
CAS REGISTRY NUMBER : 121-21-1

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* REGULATORY INFORMATION ON PESTICIDE PRODUCTS *
*
* Produced by : Agriculture and Agri-Food Canada *
* Provided by : Canadian Centre for Occupational Health and Safety *
* Issue : 96-4 (November, 1996) *

*** IDENTIFICATION ***

REGISTRATION NUMBER : 19587.00
PRODUCT NAME : PARA-PREMISE INSECTICIDE SPRAY
REGISTRANT : BAYVET DIV. CHEMAGRO LTD. (CODE: BAX)
77 BELFIELD RD.
ETOBICOKE ON
M9W 1G6
TEL : 416-240-4920
CANADIAN AGENT : CCL INDUSTRIES INC. (CODE: CCN)
190 LAKE DR. W.
AJAX ON

L1S 4Y2
TEL : 905-619-1094

*** REGISTRATION DATA ***

REGULATORY STATUS	: REGISTERED
DATE OF FIRST REGISTRATION	: 1986.12.12
METHOD OF APPLICATION	: RESIDUAL SPRAY (STRUCTURAL PEST CONTROL)
LOCATION OF USE	: DWELLINGS OUTDOOR SURFACES OF BUILDINGS OUTDOOR LIVING AREAS
MARKETING TYPE	: DOMESTIC
PRODUCT GROUP	: ARTHROPOD AND MOLLUSC CONTROLS
PRODUCT TYPE	: INSECTICIDE
FORMULATION TYPE	: PRESSURIZED PRODUCT
AERIAL APPLICATION	: UNSPECIFIED
ANTIMICROBIAL/TRADITIONAL GROUP	: TRADITIONAL
YEAR OF NEXT RE-REGISTRATION	: 1995

*** ACTIVE INGREDIENTS ***

INGREDIENT NAME :
DIAZINON (CODE: DIA)
GUARANTEED CONTENT : 0.500 %
CHEMICAL NAME :
O,O-DIETHYL O-2-ISOPROPYL-6-METHYL PYRIMIDIN-4-YL PHOSPHOROTHIOATE
CAS REGISTRY NUMBER : 333-41-5
LABEL AVAILABILITY : English Label available

*** ACTIVE INGREDIENTS ***

INGREDIENT NAME :
N-OCTYL BICYCLOHEPTENE DICARBOXIMIDE (CODE: MGK)
GUARANTEED CONTENT : 0.166 %
CHEMICAL NAME :
N-(2-ETHYLHEXYL)BICYCLO(2,2,1)-5-HEPTENE-2,3-DICARBOXIMIDE
CAS REGISTRY NUMBER : 113-48-4

INGREDIENT NAME :
PIPERONYL BUTOXIDE (CODE: PBU)
GUARANTEED CONTENT : 0.100 %
CHEMICAL NAME :
5-[2-(2-BUTOXYETHOXY)ETHOXYMETHYL]-6-PROPYL-1,3-BENZODIOXOLE
CAS REGISTRY NUMBER : 51-03-6

INGREDIENT NAME :
PYRETHRINS (CODE: PYR)
GUARANTEED CONTENT : 0.050 %
CHEMICAL NAME :
2,2-DIMETHYL-3-(2-METHYLPROPENYL) CYCLOPROPANECARBOXYLIC ACID ESTER WITH 4-HYDROXY-3-METHYL-2-(2,4-PENTADIENYL)-2-CYCLOPENTEN-1-ONE
CAS REGISTRY NUMBER : 121-21-1

*** LABEL TEXT ***

86.12.12

INSECTICIDE RESIDUEL EN AEROSOL

PARA-PREMISE(TM/MD)
RESIDUAL PREMISE INSECTICIDE SPRAY
NOT FOR USE ON DOGS AND CATS
NE PAS VAPORISER SUR LES CHIENS ET LES CHATS
KILLS: FLEAS, BROWN DOG TICKS, SPIDERS, SOWBUGS, EARWIGS, COCKROACHES, CRICKETS, MILLIPEDES, SILVERFISH, ANTS, CARPET BEETLES.
DETRUIT LES PUCES, TIQUES SANGUINES, ARAIGNEES, CLOPORTES, PERCE-OREILLES, BLATTES (COQUERELLES), GRILLONS, MILLE-PATTES, POISSONS D'ARGENT, FOURMIS ET ANTHRENES DES TAPIS.
DOMESTIC/USAGE DOMESTIQUE
GUARANTEE:
PYRETHRINS 0.05%; TECHNICAL PIPERONYL BUTOXIDE 0.1%; MGK-264 0.166%; DIAZINON 0.5%
GARANTIE:
PYRETHRINES 0,05%; PIPERONYL BUTOXYDE TECHNIQUE 0,1%; MGK-264 0,166%; DIAZINON 0,5%
REG.NO./NO.D'ENR. 19587 P.C.P. ACT/L.P.A.
DANGER
EXPLOSIVE/EXPLOSIF
EXTREMELY FLAMMABLE/EXTREMEMENT INFLAMMABLE
READ LABEL BEFORE USING/LIRE L'ETIQUETTE AVANT L'EMPLOI
NET CONTENTS/CONTENU NET: 345 g
HAVER(R)
BAYVET DIVISION
CHEMAGRO LIMITED
ETOBICOKE, ONTARIO, CANADA
M9W 1G6

Residual spray for indoor and outdoor kennel use for the control of fleas and brown dog ticks and other insects listed on the front panel.

INDOOR USE: Spot treatment: Thoroughly treat cracks, crevices, baseboards, underneath furniture and equipment, around garbage containers and animals' bedding, localized areas of floors, under floor coverings and other places inhabited by insects. Remove bedding during treatment. Repeat as necessary. Do not treat animals.

OUTDOOR USE: Spot treatment: Spray outside surfaces of screens, doors, window frames of infested kennels, animal sleeping quarters and other places where insects may alight or congregate and enter. Repeat as necessary. For ants, treat hills and runways.

DIRECTIONS: Hold container approximately 30 cm from surface being sprayed and spray until wet. Thorough applications produce a coating which will vapourize into cracks and crevices for insect control. If reinfestations occur, repeat applications as necessary. Do not inhale spray mist. Provide adequate ventilation after indoor use. Wash hands after use. KEEP PETS AND CHILDREN AWAY FROM SURFACE UNTIL DRY.

PRECAUTION: KEEP OUT OF REACH OF CHILDREN. Contents under pressure. Do not place in hot water or near radiators, stoves or other sources of heat, or store at temperatures over 50 deg C. Do not spray near open flame or spark. Harmful if swallowed, inhaled or absorbed through skin. Avoid contact with eyes, skin or clothing. DO NOT USE ON HUMANS, PLANTS, ANIMALS, OR IN FOOD STORAGE AREAS. AVOID CONTAMINATION OF FOOD STUFF, FOOD UTENSILS, FOOD PREPARATION SURFACES, WATER,

FISHBOWLS OR ANIMAL FEED AREAS. DO NOT USE AS A SPACE SPRAY.
FIRST AID TREATMENT: Contains volatile petroleum distillate. If swallowed, do not induce vomiting. Call physician immediately. Diazinon is a cholinesterase inhibitor. Atropine is antidotal. In case of contact with the skin, wash with soap and water. If in eyes, flush with water for 15 minutes, get medical attention.
DISPOSAL: When container is empty, press button to release all pressure, then dispose of in household garbage. Do not puncture or incinerate.
NOTICE TO BUYER: Seller's guarantee shall be limited to the terms set out on the label and subject thereto, the buyer assumes the risks to persons or property arising from the use or handling of this product and accepts the product on that condition.
MADE IN CANADA
SEE BOTTOM OF CAN FOR LOT NUMBER.
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REGULATORY INFORMATION ON PESTICIDE PRODUCTS

Produced by : Agriculture and Agri-Food Canada
Provided by : Canadian Centre for Occupational Health and Safety
Issue : 96-4 (November, 1996)

*** IDENTIFICATION ***

REGISTRATION NUMBER	: 20570.00
PRODUCT NAME	: VET-KEM PREMISE SPRAY
REGISTRANT	: SANDOZ AGRO CANADA INC. (CODE: SDZ) SUITE 302, PLAZA 4 2000 ARGENTIA RD. MISSISSAUGA ON L5N 1W1 TEL : 905-821-7850

*** REGISTRATION DATA ***

REGULATORY STATUS	: REGISTERED
DATE OF FIRST REGISTRATION	: 1988.06.07
METHOD OF APPLICATION	: RESIDUAL SPRAY (STRUCTURAL PEST CONTROL)
LOCATION OF USE	: DWELLINGS OUTDOOR SURFACES OF BUILDINGS OUTDOOR LIVING AREAS
MARKETING TYPE	: DOMESTIC
PRODUCT GROUP	: ARTHROPOD AND MOLLUSC CONTROLS

PRODUCT TYPE : ACARICIDE
INSECTICIDE
FORMULATION TYPE : PRESSURIZED PRODUCT
AERIAL APPLICATION : UNSPECIFIED
ANTIMICROBIAL/TRADITIONAL GROUP : TRADITIONAL
YEAR OF NEXT RE-REGISTRATION : 1998

*** ACTIVE INGREDIENTS ***

INGREDIENT NAME :
D-TRANS ALLETHRIN (CODE: ALM)
GUARANTEED CONTENT : 0.050 %
CHEMICAL NAME :
(1RS)-3-ALLYL-2-METHYL-4-OXOCYCLOPENT-2-ENYL (1R)-TRANS-CHRYSANTHEMATE
CAS REGISTRY NUMBER : 584-79-2
LABEL AVAILABILITY : English Label available

*** ACTIVE INGREDIENTS ***

INGREDIENT NAME :
CHLORPYRIFOS (CODE: DUB)
GUARANTEED CONTENT : 0.500 %
CHEMICAL NAME :
O-O-DIETHYL O-3,5,6-TRICHLORO-2-PYRIDYL PHOSPHOROTHIOATE
CAS REGISTRY NUMBER : 2921-88-2

INGREDIENT NAME :
N-OCTYL BICYCLOHEPTENE DICARBOXIMIDE (CODE: MGK)
GUARANTEED CONTENT : 0.400 %
CHEMICAL NAME :
N-(2-ETHYLHEXYL)BICYCLO(2,2,1)-5-HEPTENE-2,3-DICARBOXIMIDE
CAS REGISTRY NUMBER : 113-48-4

*** LABEL TEXT ***

93.09.10

AVAILABLE THROUGH VETERINARIANS
VET-KEM (R)
PREMISE SPRAY
INDOOR, OUTDOOR & KENNEL
PRESSURIZED CONTACT & RESIDUAL CRACK,
CREVICE & SURFACE INSECTICIDE SPRAY
Kills fleas, brown dog ticks, ants, spiders, cockroaches
DOMESTIC

GUARANTEE: Chlorpyrifos.....0.500%
d-trans Allethrin.....0.050%
N-Octyl bicycloheptene dicarboximide....0.400%

REGISTRATION NO: 20570 PEST CONTROL PRODUCTS ACT
FLAMMABLE EXPLOSIVE

WARNING
READ THE LABEL BEFORE USING
NET CONTENTS: 425 g
SANDOZ AGRO CANADA, INC.
SUITE 302, PLAZA 4, 2000 ARGENTIA RD.
MISSISSAUGA, ONT. L5N 1W1

VET-KEM is a Registered Trademark of Sandoz Ltd.
For use as a spot or crack and crevice treatment to control

fleas, brown dog ticks, ants, spiders and cockroaches.
DIRECTIONS:
"SHAKE CONTAINER WELL". Hold container approximately 30 cm. from surface being sprayed and spray until wet. Thorough applications produce a coating which will vaporize into cracks and crevices for insect control. If reinfestation occurs, repeat applications. Provide adequate ventilation after indoor use.
KEEP PETS AND CHILDREN AWAY FROM SURFACE UNTIL DRY.
INDOOR USE: Thoroughly treat cracks, crevices, baseboards, underneath furniture and equipment, around garbage containers, localized areas of floors and floor coverings (spot treatment only) and other places where fleas and other insects habitate.
OUTDOOR USE: Spray outside surfaces of screens, doors, window frames, foundations, patios, light fixtures and other places where insects may congregate or enter.
PRECAUTIONS: KEEP OUT OF REACH OF CHILDREN. Contents under pressure. Do not place in hot water or near radiators, stove or other sources of heat, or store at temperatures over 50 degrees C. Do not spray near open flame or spark. Harmful if swallowed, inhaled or absorbed through skin. Avoid contact with eyes, skin or clothing. DO NOT USE ON HUMANS, PLANTS, ANIMALS, FOODSTUFFS, FOOD UTENSILS, FISHBOWLS OR ANIMAL FEED AREAS. DO NOT USE AS A SPACE SPRAY. DO NOT CONTAMINATE FOODSTUFFS. Do not use in any area where food may be exposed. Do not use in bulk food storage areas. Do not use in cupboards where food or cooking utensils are stored. In homes or dwellings, remove or cover all exposed food and cooking utensils before spraying. Thoroughly wash all surfaces that might contact food before re-use.
FIRST AID TREATMENT: Contains volatile petroleum distillate. If swallowed, do not induce vomiting. Call physician immediately. Chlorpyrifos is a cholinesterase inhibitor. Atropine is antidotal. In case of contact with the skin, wash with soap and water. If in eyes, flush with water 15 minutes, get medical attention.
DISPOSAL: When container is empty, press button to release all pressure, then dispose in household garbage. Do not puncture or incinerate.

HOT LINE: 1-800-766-7378

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* REGULATORY INFORMATION ON PESTICIDE PRODUCTS *
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* Produced by : Agriculture and Agri-Food Canada *
* Provided by : Canadian Centre for Occupational Health and Safety *
* Issue : 96-4 (November, 1996) *

*** IDENTIFICATION ***

REGISTRATION NUMBER : 20669.00
PRODUCT NAME : SIPHEX-14 CARPET & PREMISE CONTACT & RESIDUAL SPRAY
REGISTRANT : JANSSEN PHARMACEUTICA (CODE: JAN)
ATTN: MGR VET. MEDICAL AFFAIRS
1-6705 MILLCREEK DR.
MISSISSAUGA ON
L5N 5R9
TEL : 905-821-9161
CANADIAN AGENT : CCL INDUSTRIES INC. (CODE: CCN)
190 LAKE DR. W.
AJAX ON
L1S 4Y2
TEL : 905-619-1094

*** REGISTRATION DATA ***

REGULATORY STATUS : REGISTERED
DATE OF FIRST REGISTRATION : 1988.07.06
METHOD OF APPLICATION : CONTACT SPRAY (STRUCTURAL PEST CONTROL)
RESIDUAL SPRAY (STRUCTURAL PEST CONTROL)
LOCATION OF USE : DWELLINGS
OUTDOOR SURFACES OF BUILDINGS
OUTDOOR LIVING AREAS
MARKETING TYPE : DOMESTIC
PRODUCT GROUP : ARTHROPOD AND MOLLUSC CONTROLS
PRODUCT TYPE : ACARICIDE
INSECTICIDE
FORMULATION TYPE : PRESSURIZED PRODUCT
AERIAL APPLICATION : UNSPECIFIED
ANTIMICROBIAL/TRADITIONAL GROUP : TRADITIONAL
YEAR OF NEXT RE-REGISTRATION : 1995

*** ACTIVE INGREDIENTS ***

INGREDIENT NAME :
D-TRANS ALLETHRIN (CODE: ALM)
GUARANTEED CONTENT : 0.050 %
CHEMICAL NAME :
(1RS)-3-ALLYL-2-METHYL-4-OXOCYCLOPENT-2-ENYL (1R)-TRANS-CHRYSANTHEMATE
CAS REGISTRY NUMBER : 584-79-2
LABEL AVAILABILITY : English Label available

*** ACTIVE INGREDIENTS ***

INGREDIENT NAME :
CHLORPYRIFOS (CODE: DUB)
GUARANTEED CONTENT : 0.500 %
CHEMICAL NAME :
O-O-DIETHYL O-3,5,6-TRICHLORO-2-PYRIDYL PHOSPHOROTHIOATE
CAS REGISTRY NUMBER : 2921-88-2

INGREDIENT NAME :
N-OCTYL BICYCLOHEPTENE DICARBOXIMIDE (CODE: MGK)
GUARANTEED CONTENT : 0.400 %
CHEMICAL NAME :

N-(2-ETHYLHEXYL)BICYCLO(2,2,1)-5-HEPTENE-2,3-DICARBOXIMIDE
CAS REGISTRY NUMBER : 113-48-4

*** LABEL TEXT ***

88.07.04

SIPHEX*14
CARPET AND PREMISE
VAPORISATEUR DE TAPIS ET DE SURFACE
CONTACT AND RESIDUAL CARPET AND PREMISE SPRAY
AGIT PAR CONTACT ET PAR EFFECT RESIDUEL
KILLS FLEAS, ANTS, CARPET BEETLES, CRICKETS, EARWIGS, MILLIPEDES, COCKROACHES, SILVERFISH, SOWBUGS, SPIDERS AND BROWN DOG TICKS.
DETRUIT PUCES, FOURMIS, ANTHRENES DE TAPIS, GRILLONS, PERCE-OREILLES, MILLE-PATTES, BLATTES, LEPISMES, PUNAISES, ARAIGNEES ET TIQUES BRUNES.
DOMESTIC/DOMESTIQUE
GUARANTEE/GARANTIE:
D-TRANS ALLETHRIN.....0.050%
N-OCTYL BICYCLOHEPTENE CARBOXIMIDE.....0.400%
CHLORPYRIFOS.....0.500%
NET CONTENTS 350 g CONTENU NET
SHAKE WELL BEFORE USING/BIEN AGITER LE CONTENANT
REG.NO. 20669 PCP ACT
NO.D'ENR. 20669 L.P.A.
READ LABEL BEFORE USING/LIRE L'ETIQUETTE AVANT L'EMPLOI
KEEP OUT OF REACH OF CHILDREN
CONSERVER HORS DE PORTEE DES ENFANTS
WARNING/AVERTISSEMENT
FLAMMABLE/INFLAMMABLE
EXPLOSIVE/EXPLOSIF
JANSSEN PHARMACEUTICA
6705 MILLCREEK DRIVE, MISSISSAUGA, ONTARIO L5N 5M4

SIPHEX*14 CARPET AND PREMISE IS FORMULATED FOR USE AS A SPOT OR CRACK AND CREVICE TREATMENT TO PROVIDE BOTH CONTACT AND RESIDUAL CONTROL OF INSECTS LISTED ON THE FRONT PANEL.

INDOOR USE: For spot treatment of floors and floor coverings including carpets and broadloom as well as cracks, crevices, baseboards, underneath furniture and equipment, around garbage containers, localized areas of floors and floor coverings(spot treatment only) where insect habitat.

OUTDOOR USE: Spray outside surfaces of screens, doors, window frames, foundations, patios, light fixtures and other places where insect may alight, or congregate and enter.

DIRECTIONS: SHAKE CONTAINER WELL. Hold container upright approximately 30cm. from surface being sprayed and spray until wet. Test a small inconspicuous area of carpet for colour fastness. Thorough applications produce a coating which will vapourize into cracks and crevices for insect control. If reinfestations occur, repeat applications. PROVIDE ADEQUATE VENTILATION AFTER INDOOR USE. KEEP PETS AND CHILDREN AWAY UNTIL RESIDUE IS DRY.

PRECAUTIONS: KEEP OUT OF REACH OF CHILDREN. Contents under pressure. Do not place in hot water or near radiators, stove or other sources of heat, or store at temperatures over 50 deg C. Do not spray near open flame or spark. Harmful if

swallowed, inhaled or absorbed through skin. Avoid contact with eyes, skin or clothing. DO NOT USE ON HUMANS, PLANTS, ANIMALS, FOOD STUFF, FOOD UTENSILS, FISHBOWLS OR ANIMAL FEED AREAS. DO NOT USE AS A SPACE SPRAY. DO NOT CONTAMINATE FOODSTUFFS. Do not use in any area where food may be exposed. Do not use in bulk food storage areas. Do not use in cupboards where food or cooking utensils are stored. In home or dwellings, remove or cover all exposed food and cooking utensils before spraying. Thoroughly wash all surfaces that might contact food before reuse.
FIRST AID TREATMENT: Contains volatile petroleum distillate. If swallowed, do not induce vomiting. Call physician immediately. Chlorpyrifos is a cholinesterase inhibitor. Atropine is antidotal. In case of contact with the skin, wash with soap and water. If in eyes, flush with water 15 minutes, get medical attention.
DISPOSAL: When container is empty, press button to release all pressure, then dispose in household garbage. Do not puncture or incinerate.
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* REGULATORY INFORMATION ON PESTICIDE PRODUCTS *
*
* Produced by : Agriculture and Agri-Food Canada *
* Provided by : Canadian Centre for Occupational Health and Safety *
* Issue : 96-4 (November, 1996) *

*** IDENTIFICATION ***

REGISTRATION NUMBER	: 20697.00
PRODUCT NAME	: SIPHEX-14 PET & PREMISE PUMP SPRAY
REGISTRANT	: JANSSEN PHARMACEUTICA (CODE: JAN) ATTN: MGR VET. MEDICAL AFFAIRS 1-6705 MILLCREEK DR. MISSISSAUGA ON L5N 5R9 TEL : 905-821-9161
CANADIAN AGENT	: CCL INDUSTRIES INC. (CODE: CCN) 190 LAKE DR. W. AJAX ON L1S 4Y2 TEL : 905-619-1094

*** REGISTRATION DATA ***

REGULATORY STATUS	: HISTORICAL

DATE OF FIRST REGISTRATION : 1989.12.12
DATE OF LAST REGISTRATION : 90.12.31
METHOD OF APPLICATION : RESIDUAL SPRAY (STRUCTURAL PEST CONTROL)
TOPICAL APPLICATION
LOCATION OF USE : DOMESTIC PETS
DWELLINGS
MARKETING TYPE : DOMESTIC
PRODUCT GROUP : ARTHROPOD AND MOLLUSC CONTROLS
PRODUCT TYPE : ACARICIDE
INSECTICIDE
FORMULATION TYPE : PRESSURIZED PRODUCT
AERIAL APPLICATION : UNSPECIFIED
ANTIMICROBIAL/TRADITIONAL GROUP : TRADITIONAL
REASON FOR DISAPPEARANCE : NOT ELIGIBLE FOR REGISTRATION

*** ACTIVE INGREDIENTS ***

INGREDIENT NAME :
PERMETHRIN (CODE: PFL)
GUARANTEED CONTENT : 0.050 %
CHEMICAL NAME :
3-PHENOXYBENZYL (1 RS, 3RS)-(1 RS, 3 SR)-3-(2,2-DICHLOROVINYL)-2,2-DIMETHYL-CYCLOPROPANECARBOXYLATE
CAS REGISTRY NUMBER : 52645-53-1

INGREDIENT NAME :
PYRETHRINS (CODE: PYR)
GUARANTEED CONTENT : 0.056 %
CHEMICAL NAME :
2,2-DIMETHYL-3-(2-METHYLPROPENYL) CYCLOPROPANECARBOXYLIC ACID ESTER WITH 4-HYDROXY-3-METHYL-2-(2,4-PENTADIENYL)-2-CYCLOPENTEN-1-ONE
CAS REGISTRY NUMBER : 121-21-1

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* REGULATORY INFORMATION ON PESTICIDE PRODUCTS *
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* Produced by : Agriculture and Agri-Food Canada *
* Provided by : Canadian Centre for Occupational Health and Safety *
* Issue : 96-4 (November, 1996) *

*** IDENTIFICATION ***

REGISTRATION NUMBER : 21118.00
PRODUCT NAME : CYCLE BREAKER 2 (PREMISE AEROSOL APRAY)
REGISTRANT : VETREPHARM INC. (CODE: VTR)
ATTN: REGULATORY AFFAIRS MGR
27-69 BESSEMER RD.
LONDON ON
N6E 2V6
TEL : 519-685-5800

*** REGISTRATION DATA ***

REGULATORY STATUS : REGISTERED

DATE OF FIRST REGISTRATION : 1989.06.29
METHOD OF APPLICATION : RESIDUAL SPRAY (STRUCTURAL PEST CONTROL)
LOCATION OF USE : DWELLINGS
MARKETING TYPE : DOMESTIC
PRODUCT GROUP : ARTHROPOD AND MOLLUSC CONTROLS
PRODUCT TYPE : ACARICIDE
INSECTICIDE
FORMULATION TYPE : FORMULATION CODE NOT APPLICABLE
AERIAL APPLICATION : UNSPECIFIED
ANTIMICROBIAL/TRADITIONAL GROUP : TRADITIONAL
YEAR OF NEXT RE-REGISTRATION : 1995

*** ACTIVE INGREDIENTS ***

INGREDIENT NAME :
PROPOXUR (CODE: BAY)
GUARANTEED CONTENT : 0.500 %
CHEMICAL NAME :
2-ISOPROPOXYPHENYL METHYLCARBAMATE
CAS REGISTRY NUMBER : 114-26-1
LABEL AVAILABILITY : English Label available

*** ACTIVE INGREDIENTS ***

INGREDIENT NAME :
N-OCTYL BICYCLOHEPTENE DICARBOXIMIDE (CODE: MGK)
GUARANTEED CONTENT : 0.166 %
CHEMICAL NAME :
N-(2-ETHYLHEXYL)BICYCLO(2,2,1)-5-HEPTENE-2,3-DICARBOXIMIDE
CAS REGISTRY NUMBER : 113-48-4

INGREDIENT NAME :
PIPERONYL BUTOXIDE (CODE: PBU)
GUARANTEED CONTENT : 0.100 %
CHEMICAL NAME :
5-[2-(2-BUTOXYETHOXY)ETHOXYMETHYL]-6-PROPYL-1,3-BENZODIOXOLE
CAS REGISTRY NUMBER : 51-03-6

INGREDIENT NAME :
PYRETHRINS (CODE: PYR)
GUARANTEED CONTENT : 0.050 %
CHEMICAL NAME :
2,2-DIMETHYL-3-(2-METHYLPROPENYL) CYCLOPROPANECARBOXYLIC ACID ESTER WITH 4-HYDROXY-3-METHYL-2-(2,4-PENTADIENYL)-2-CYCLOPENTEN-1-ONE
CAS REGISTRY NUMBER : 121-21-1

*** LABEL TEXT ***

DOMESTIC
NET CONTENTS: 350 g
OZONE FRIENDLY * NO CFC'S
Premise Aerosol Spray
CYCLE BREAKER 2
QUICK KILL * RESIDUAL ACTION
Kills Dog and Cat Flea, American Dog Tick and Brown Dog Tick in Dwellings.
READ THE LABEL BEFORE USING

GUARANTEE:

Pyrethrins	0.050%
Piperonyl Butoxide Technical	0.100%
Propoxur	0.500%
N-Octyl Bicycloheptene Dicarboximide	0.166%

REG. NO. 21118 P.C.P. ACT
DANGER
EXTREMELY FLAMMABLE
EXPLOSIVE
Vetrepharm Inc.
69 Bessemer Rd., Unit 27, London, Ontario N6E 2V6
DIRECTIONS: Shake well before using. Hold can in upright position and apply as a coarse spray to localized area where pests are found, such as baseboards, window and door frames, sleeping quarters of pets and floors. Bedding should be replaced in animals' quarters after treatment. DO NOT TREAT ANIMAL. For crack and crevice areas, apply as a pin stream, using the extension tube that is attached to the cap and insert into the actuator. This can be used to spray between different elements of construction, between appliances and floors, openings leading to voids and hollow spaces in walls. If reinfestation occurs, repeat applications as necessary.
PRECAUTIONS: KEEP OUT OF REACH OF CHILDREN. Contents under pressure. Do not place in hot water or near radiators, stoves or other sources of heat or store at temperatures over 50oC. Harmful if swallowed, inhaled or absorbed through skin. Avoid contact with eyes, skin or clothing. DO NOT USE ON HUMANS,PLANTS, ANIMALS, FOOD STUFFS, FOOD UTENSILS, FISH BOWLS, OR ANIMAL FEED AREAS. DO NOT USE AS A SPACE SPRAY. Dispose of empty containers in regular household garbage. Do not use in food handling or food storage areas. Keep children and pets away from treated surfaces until dry. Do not spray near flame or spark.
FIRST AID: Contains volatile petroleum distillate. Call physician immediately. Propoxur is a cholinesterase inhibitor. Atropine is antidotal. In case of contact with skin, wash with soap and water. If in eyes, flush with water for 15 minutes, get medical attention.
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* REGULATORY INFORMATION ON PESTICIDE PRODUCTS *
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* Produced by : Agriculture and Agri-Food Canada *
* Provided by : Canadian Centre for Occupational Health and Safety *
* Issue : 96-4 (November, 1996) *

*** IDENTIFICATION ***

REGISTRATION NUMBER : 21543.00
PRODUCT NAME : RALSTON COUNTRY ROADS YARD & PREMISE SPRAY
REGISTRANT : RALSTON PURINA CANADA INC. (CODE: RAK)
ATTN: ANIMAL HEALTH COORD.
404 MAIN STREET
WOODSTOCK ON
N4S 7X5
TEL : 519-539-8562

*** REGISTRATION DATA ***

REGULATORY STATUS : REGISTERED
DATE OF FIRST REGISTRATION : 1990.06.08
METHOD OF APPLICATION : RESIDUAL SPRAY (STRUCTURAL PEST CONTROL)
LOCATION OF USE : DWELLINGS
OUTDOOR LIVING AREAS
MARKETING TYPE : DOMESTIC
PRODUCT GROUP : ARTHROPOD AND MOLLUSC CONTROLS
PRODUCT TYPE : ACARICIDE
INSECTICIDE
FORMULATION TYPE : SOLUTION
AERIAL APPLICATION : UNSPECIFIED
ANTIMICROBIAL/TRADITIONAL GROUP : TRADITIONAL
YEAR OF NEXT RE-REGISTRATION : 1995

*** ACTIVE INGREDIENTS ***

INGREDIENT NAME :
D-TRANS ALLETHRIN (CODE: ALM)
GUARANTEED CONTENT : 0.050 %
CHEMICAL NAME :
(1RS)-3-ALLYL-2-METHYL-4-OXOCYCLOPENT-2-ENYL (1R)-TRANS-CHRYSANTHEMATE
CAS REGISTRY NUMBER : 584-79-2
LABEL AVAILABILITY : English Label available

*** ACTIVE INGREDIENTS ***

INGREDIENT NAME :
CHLORPYRIFOS (CODE: DUB)
GUARANTEED CONTENT : 0.500 %
CHEMICAL NAME :
O-O-DIETHYL O-3,5,6-TRICHLORO-2-PYRIDYL PHOSPHOROTHIOATE
CAS REGISTRY NUMBER : 2921-88-2

INGREDIENT NAME :
N-OCTYL BICYCLOHEPTENE DICARBOXIMIDE (CODE: MGK)
GUARANTEED CONTENT : 0.400 %
CHEMICAL NAME :
N-(2-ETHYLHEXYL)BICYCLO(2,2,1)-5-HEPTENE-2,3-DICARBOXIMIDE
CAS REGISTRY NUMBER : 113-48-4

*** LABEL TEXT ***

90.06.08

RALSTON COUNTRY ROADS
LA TRADITION DE RALSTON
READY-TO-USE . LONG-LASTING
PRET A EMPLOYER . A ACTION PROLONGEE
YARD AND PREMISE SPRAY
VAPORISATION POUR COURS ET LOCAUX
DOMESTIC/DOMESTIQUE
READ THE LABEL BEFORE USING/LIRE L'ETIQUETTE AVANT L'EMPLOI

GUARANTEE:
D-TRANS ALLETHRIN 0.050%
N-OCTYL BICYCLOHEPTENE DICARBOXIMIDE 0.400%
CHLORPYRIFOS 0.500%

GARANTIE:
D-TRANS ALLETHRINE 0.050%
DICARBOXIMIDE DE BICYCLOHEPTENE N-OCTYLIQUE 0.400%
CHLORPYRIFOS 0.500%

REG.NO/NO.D'ENR. 21543 P.C.P. ACT/L.P.A.
682 mL
DISTRIBUTED BY/DISTRIBUE PAR
RALSTON PURINA CANADA INC.
WOODSTOCK, ONT. CANADA N4S 7X5
MADE IN CANADA/FABRIQUE AU CANADA

YARD AND PREMISE SPRAY
CONTROLS AMERICAN (BROWN AND DOG)TICKS AND
AMERICAN DOG AND CAT FLEAS
CONTACT AND RESIDUAL CRACK, CREVICE AND SURFACE
(SPOT TREATMENT ONLY) SPRAY

INDOOR USE: Thoroughly treat cracks, crevices, baseboards, underneath furniture and equipment, around garbage containers, localized areas(spot treatment only) of floors and floor coverings and other places where insects habitate.

OUTDOOR USE: Spray outside surfaces of screens, doors, window frames, foundations, patios, light fixtures and other places where insects may alight, or congregate and enter.

DIRECTIONS: DO NOT USE AS A SPACE SPRAY. Hold container approximately 30 cm from surface being sprayed and spray until wet. Thorough applications produce a coating which will vapourize into cracks and crevices for insect control. Provide adequate ventilation after indoor use. KEEP PETS AND CHILDREN AWAY FROM SURFACE UNTIL DRY.

PRECAUTIONS: KEEP OUT OF REACH OF CHILDREN. Harmful if swallowed, inhaled or absorbed through skin. Avoid contact with eyes, skin or clothing. DO NOT USE ON HUMANS, PLANTS, ANIMALS, FOODSTUFF, FOOD UTENSILS, FISHBOWLS OR ANIMAL FEED AREAS. DO NOT CONTAMINATE FOODSTUFFS. Do not use in any area where food may be exposed. Do not use in bulk food storage areas. Do not use in cupboards where food or cooking utensils are stored. In homes or dwellings, remove or cover all exposed food and cooking utensils before spraying. Thoroughly wash all surfaces that might contact food before reuse.

FIRST AID TREATMENT: Contains volatile petroleum distillate. If swallowed, do not induce vomiting. Call physician immediately. Chlorpyrifos is a cholinesterase inhibitor. Atropine is antidotal. In case of contact with skin, wash with soap and water. If in eyes, flush with water for 15 minutes and get medical attention.

DISPOSAL: Dispose of empty container with regular garbage. Do not reuse.

* *
* REGULATORY INFORMATION ON PESTICIDE PRODUCTS *
*
* Produced by : Agriculture and Agri-Food Canada *
* Provided by : Canadian Centre for Occupational Health and Safety *
* Issue : 96-4 (November, 1996) *

*** IDENTIFICATION ***

REGISTRATION NUMBER : 21578.00
PRODUCT NAME : BANDIT PREMISE AEROSOL SPRAY
REGISTRANT : ANIMAX (CODE: AMX)
383 SOVEREIGN RD
LONDON ON
N6M 1A3
TEL : 519-453-3384

*** REGISTRATION DATA ***

REGULATORY STATUS : REGISTERED
DATE OF FIRST REGISTRATION : 1990.05.22
METHOD OF APPLICATION : RESIDUAL SPRAY (STRUCTURAL PEST CONTROL)
LOCATION OF USE : DWELLINGS
MARKETING TYPE : DOMESTIC
PRODUCT GROUP : ARTHROPOD AND MOLLUSC CONTROLS
PRODUCT TYPE : ACARICIDE
INSECTICIDE
FORMULATION TYPE : PRESSURIZED PRODUCT
AERIAL APPLICATION : UNSPECIFIED
ANTIMICROBIAL/TRADITIONAL GROUP : TRADITIONAL
YEAR OF NEXT RE-REGISTRATION : 1995

*** ACTIVE INGREDIENTS ***

INGREDIENT NAME :
PROPOXUR (CODE: BAY)
GUARANTEED CONTENT : 0.500 %
CHEMICAL NAME :
2-ISOPROPOXYPHENYL METHYLCARBAMATE
CAS REGISTRY NUMBER : 114-26-1
LABEL AVAILABILITY : English Label available

*** ACTIVE INGREDIENTS ***

INGREDIENT NAME :

N-OCTYL BICYCLOHEPTENE DICARBOXIMIDE (CODE: MGK)
GUARANTEED CONTENT : 0.166 %
CHEMICAL NAME :
N-(2-ETHYLHEXYL)BICYCLO(2,2,1)-5-HEPTENE-2,3-DICARBOXIMIDE
CAS REGISTRY NUMBER : 113-48-4

INGREDIENT NAME :
PIPERONYL BUTOXIDE (CODE: PBU)
GUARANTEED CONTENT : 0.100 %
CHEMICAL NAME :
5-[2-(2-BUTOXYETHOXY)ETHOXYMETHYL]-6-PROPYL-1,3-BENZODIOXOLE
CAS REGISTRY NUMBER : 51-03-6

INGREDIENT NAME :
PYRETHRINS (CODE: PYR)
GUARANTEED CONTENT : 0.050 %
CHEMICAL NAME :
2,2-DIMETHYL-3-(2-METHYLPROPENYL) CYCLOPROPANECARBOXYLIC ACID ESTER WITH 4-HYDROXY-3-METHYL-2-(2,4-PENTADIENYL)-2-CYCLOPENTEN-1-ONE
CAS REGISTRY NUMBER : 121-21-1

*** LABEL TEXT ***

DOMESTIC
NET CONTENTS: 350 g
BANDIT
PREMISE AEROSOL SPRAY
QUICK KILL * RESIDUAL ACTION
Kills Dog and Cat Flea, American Dog Tick and Brown Dog Tick in Dwellings.
READ THE LABEL BEFORE USING
GUARANTEE:

Pyrethrins	0.050%
Piperonyl Butoxide Technical	0.100%
Propoxur	0.050%
N-Octyl Bicycloheptene Dicarboximide	0.166%

REG. NO. 21578 P.C.P. ACT
DANGER
EXTREMELY FLAMMABLE
EXPLOSIVE
OZONE FRIENDLY * NO CFC'S
ANIMAX
69 Bessemer Rd., Unit 27, London, Ontario N6E 2V6
DIRECTIONS: Shake well before using. Hold can in upright position and apply as a coarse spray to localized area where pests are found, such as baseboards, window and door frames, sleeping quarters of pets and floors. Bedding should be replaced in animals' quarters after treatment. DO NOT TREAT ANIMAL. For crack and crevice areas, apply as a pin stream, using the extension tube that is attached to the cap and insert into the actuator. This can be used to spray between different elements of construction, between appliances and floors, openings leading to voids and hollow spaces in walls. If reinfestation occurs, repeat applications as necessary.
PRECAUTIONS: KEEP OUT OF REACH OF CHILDREN. Contents under pressure. Do not place in hot water or near radiators, stoves

or other sources of heat or store at temperatures over 50oC. Harmful if swallowed, inhaled or absorbed through skin. Avoid contact with eyes, skin or clothing. DO NOT USE ON HUMANS, PLANTS, ANIMALS, FOOD STUFFS, FOOD UTENSILS, FISH BOWLS, OR ANIMAL FEED AREAS. DO NOT USE AS A SPACE SPRAY. Dispose of empty containers in regular household garbage. Do not use in food handling or food storage areas. Keep children and pets away from treated surfaces until dry. Do not spray near flame or spark.
FIRST AID: Contains volatile petroleum distillate. Call physician immediately. Propoxur is a cholinesterase inhibitor. Atropine is antidotal. In case of contact with skin, wash with soap and water. If in eyes, flush with water for 15 minutes, get medical attention.
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* REGULATORY INFORMATION ON PESTICIDE PRODUCTS *
*
* Produced by : Agriculture and Agri-Food Canada *
* Provided by : Canadian Centre for Occupational Health and Safety *
* Issue : 96-4 (November, 1996) *

*** IDENTIFICATION ***

REGISTRATION NUMBER	: 21692.00
PRODUCT NAME	: SIPHEX 14 DS PET & PREMISE PUMP
REGISTRANT	: JANSSEN PHARMACEUTICA (CODE: JAN) ATTN: MGR VET. MEDICAL AFFAIRS 1-6705 MILLCREEK DR. MISSISSAUGA ON L5N 5R9 TEL : 905-821-9161
CANADIAN AGENT	: CCL INDUSTRIES INC. (CODE: CCN) 190 LAKE DR. W. AJAX ON L1S 4Y2 TEL : 905-619-1094

*** REGISTRATION DATA ***

REGULATORY STATUS	: REGISTERED
DATE OF FIRST REGISTRATION	: 1990.10.16
METHOD OF APPLICATION	: CONTACT SPRAY (STRUCTURAL PEST CONTROL) RESIDUAL SPRAY (STRUCTURAL PEST CONTROL) TOPICAL APPLICATION
LOCATION OF USE	: DOMESTIC PETS

DWELLINGS
MARKETING TYPE : DOMESTIC
PRODUCT GROUP : ARTHROPOD AND MOLLUSC CONTROLS
PRODUCT TYPE : ACARICIDE
INSECTICIDE
FORMULATION TYPE : SOLUTION
AERIAL APPLICATION : UNSPECIFIED
ANTIMICROBIAL/TRADITIONAL GROUP : TRADITIONAL
YEAR OF NEXT RE-REGISTRATION : 1995

*** ACTIVE INGREDIENTS ***

INGREDIENT NAME :
N-OCTYL BICYCLOHEPTENE DICARBOXIMIDE (CODE: MGK)
GUARANTEED CONTENT : 0.168 %
CHEMICAL NAME :
N-(2-ETHYLHEXYL)BICYCLO(2,2,1)-5-HEPTENE-2,3-DICARBOXIMIDE
CAS REGISTRY NUMBER : 113-48-4
LABEL AVAILABILITY : English Label available

*** ACTIVE INGREDIENTS ***

INGREDIENT NAME :
PIPERONYL BUTOXIDE (CODE: PBU)
GUARANTEED CONTENT : 0.100 %
CHEMICAL NAME :
5-[2-(2-BUTOXYETHOXY)ETHOXYMETHYL]-6-PROPYL-1,3-BENZODIOXOLE
CAS REGISTRY NUMBER : 51-03-6

INGREDIENT NAME :
PERMETHRIN (CODE: PFL)
GUARANTEED CONTENT : 0.050 %
CHEMICAL NAME :
3-PHENOXYBENZYL (1 RS, 3RS)-(1 RS, 3 SR)-3-(2,2-DICHLOROVINYL)-2,2-DIMETHYL-CYCLOPROPANECARBOXYLATE
CAS REGISTRY NUMBER : 52645-53-1

INGREDIENT NAME :
PYRETHRINS (CODE: PYR)
GUARANTEED CONTENT : 0.106 %
CHEMICAL NAME :
2,2-DIMETHYL-3-(2-METHYLPROPENYL) CYCLOPROPANECARBOXYLIC ACID ESTER WITH 4-HYDROXY-3-METHYL-2-(2,4-PENTADIENYL)-2-CYCLOPENTEN-1-ONE
CAS REGISTRY NUMBER : 121-21-1

*** LABEL TEXT ***

90.10.16

Siphex* 14 DS
Pet and Premise Pump
Contact and Residual Flea & Tick Spray
Kills Fleas and Ticks on Dogs and Cats, Such as American Dog and Cat Flea, American (Dog & Brown) Tick.
DOMESTIC

GUARANTEE:

Pyrethrins	0.106%
Piperonyl butoxide	0.100%

N-Octyl bicycloheptene dicarboximide 0.168%
Permethrin 0.050%

NET CONTENTS
450 mL
SHAKE WELL BEFORE USING
Reg. No. 21692 P.C.P. Act
READ LABEL BEFORE USING
KEEP OUT OF REACH
OF CHILDREN
CAUTION FLAMMABLE
JANSSEN
PHARMACEUTICA
6705 MILLCREEK DRIVE
MISSISSAUGA, ONTARIO L5N 5M4
Distributed by
MTC PHARMACEUTICALS
SHAKE
WELL

DIRECTIONS: Shake well before using. Hold container in upright position 25 to 30 cm from pet and spray entire body beginning at tail and working towards the head. Do not spray face, eyes or scrotum. As you spray, fluff the hair so that spray will penetrate to the skin, but spray only until hair is damp - not wet. Spray ticks directly. Also spray bed and living quarters if needed. Repeat as necessary. Do NOT use on nursing puppies or kittens under 8 weeks of age or on nursing females. Do not spray more than once a week. Consult veterinarian before using on pregnant animals. Do not use on sick animals or animals under drug or other pesticide treatment.

PRECAUTIONS: KEEP OUT OF REACH OF CHILDREN. Discontinue use if dermal or nasal irritation develops. Do not use near fish, food or foodstuffs. Avoid inhalation of spray. Avoid skin contact by wearing rubber gloves. Wash hands after use. Do not reuse container. Dispose of empty container in regular household garbage.

FIRST AID: If sprayed in eyes, flush with clean water. If irritation persists, obtain medical attention. If accidentally swallowed, obtain medical attention at once.

* Trademark

OZONE FRIENDLY
NO CFC'S

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* Provided by : Canadian Centre for Occupational Health and Safety *
* Issue : 96-4 (November, 1996) *

*** IDENTIFICATION ***

REGISTRATION NUMBER : 21762.00
PRODUCT NAME : ZODIAC ENDALSECT PREMISE FLEA SPRAY
REGISTRANT : SANDOZ AGRO CANADA INC. (CODE: SDZ)
SUITE 302, PLAZA 4
2000 ARGENTIA RD.
MISSISSAUGA ON
L5N 1W1
TEL : 905-821-7850

*** REGISTRATION DATA ***

REGULATORY STATUS : REGISTERED
DATE OF FIRST REGISTRATION : 1990.07.27
METHOD OF APPLICATION : CONTACT SPRAY (STRUCTURAL PEST CONTROL)
RESIDUAL SPRAY (STRUCTURAL PEST CONTROL)
LOCATION OF USE : DWELLINGS
MARKETING TYPE : DOMESTIC
PRODUCT GROUP : ARTHROPOD AND MOLLUSC CONTROLS
PRODUCT TYPE : INSECTICIDE
FORMULATION TYPE : SOLUTION
AERIAL APPLICATION : UNSPECIFIED
ANTIMICROBIAL/TRADITIONAL GROUP : TRADITIONAL
YEAR OF NEXT RE-REGISTRATION : 1998

*** ACTIVE INGREDIENTS ***

INGREDIENT NAME :
CHLORPYRIFOS (CODE: DUB)
GUARANTEED CONTENT : 0.225 %
CHEMICAL NAME :
O-O-DIETHYL O-3,5,6-TRICHLORO-2-PYRIDYL PHOSPHOROTHIOATE
CAS REGISTRY NUMBER : 2921-88-2
LABEL AVAILABILITY : English Label available

*** ACTIVE INGREDIENTS ***

INGREDIENT NAME :
METHOPRENE (CODE: MPR)
GUARANTEED CONTENT : 0.007 %
CHEMICAL NAME :
ISOPROPYL (E,E) 11-METHOXY-3,7,11-TRIMETHYL-2,4-DODECADIENOATE
CAS REGISTRY NUMBER : 40596-69-8

*** LABEL TEXT ***

93.09.21

ZODIAC(R)
ENDALSECT(TM)
PREMISE FLEA SPRAY
KILLS ADULT AND PRE-ADULT FLEAS
KEEP OUT OF REACH OF CHILDREN
READ THE LABEL BEFORE USING

DOMESTIC

GUARANTEE: (S)-Methoprene.....0.007%
Chlorpyrifos.....0.225%

REG. NO.: 21762 P.C.P. ACT

946 mL

SANDOZ AGRO CANADA, INC.
SUITE 302, PLAZA 4, 2000 ARGENTIA RD.
MISSISSAUGA, ONT. L5N 1W1

ENDALSECT PREMISE FLEA SPRAY is a contact and residual crack and crevice and surface spray. It contains a unique combination of ingredients that kills both adult and pre-adult dog and catfleas. It kills fleas hidden in carpets, rugs, furniture and pet bedding. One treatment gives continuous protection against pre-adult fleas for 6 months. Direct application of ENDALSECT PREMISE FLEA SPRAY to the insect also kills American brown and American dog ticks, cockroaches, ants, spiders, crickets, silverfish, earwigs and pillbugs. It leaves no bad smell and no sticky mess. Because of the long term flea control provided by ENDALSECT PREMISE FLEA SPRAY, regular use of this product will reduce the need for topical treatment of pets for ectoparasites.

DIRECTIONS FOR USE:

SHAKE WELL BEFORE USING:

For effective flea control adjust the spray nozzle to create a fine spray and apply uniformly without wetting furniture and carpeting. Thorough applications produce a coating which will vaporize into cracks and crevices for insect control. If re-infestations occur, repeat application. Provide adequate ventilation after use and keep pets and children away from surface until dry. Thoroughly treat cracks and crevices, baseboards, underneath furniture, localize areas of floors and floor coverings (spot treatment only) and other places where fleas are found.

PRECAUTIONARY STATEMENTS:

Harmful if swallowed or absorbed through skin. Avoid breathing spray. Avoid contact with skin, eyes or clothing. Wash thoroughly after handling. DO NOT ALLOW CHILDREN OR PETS TO WALK ON TREATED SURFACES UNTIL COMPLETELY DRY. DO NOT SPRAY ON ANIMALS, HUMANS, PLANTS, FOODSTUFFS, FOOD UTENSILS, FISHBOWLS OR ANIMAL FEED AREAS. DO NOT CONTAMINATE FOODSTUFFS. Remove all pets and cover fish bowls before spraying. Do not use as a space spray. Do not use in areas of food processing plants, restaurants, etc. where food is commercially prepared, processed or exposed. Do not use in serving areas where food is exposed. Thoroughly wash all surfaces that might contact food before re-use.

FIRST AID

If swallowed: Drink 1 or 2 glasses of water and induce vomiting by touching finger to back of throat. Never give anything by mouth to an unconscious or convulsing person. Seek medical attention immediately. If on skin: Remove contaminated clothing and wash affected areas with soap and water. If in eyes: Flush eyes with plenty of water. If irritation persists, call physician.

TOXICOLOGICAL INFORMATION: Chlorpyrifos is a cholinesterase inhibitor. Atropine sulfate by injection is antidotal only if symptoms of cholinesterase inhibition are present.

STORAGE AND DISPOSAL:

STORE IN ORIGINAL CONTAINER, AWAY FROM CHILDREN. Protect from

freezing or high temperatures. Do not reuse empty container.
Wrap empty container and place in household garbage.
ZODIAC is a registered trademark and ENDALSECT is a trademark of Sandoz Ltd.
HOT LINE: 1-800-688-7378
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* REGULATORY INFORMATION ON PESTICIDE PRODUCTS *
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* Produced by : Agriculture and Agri-Food Canada *
* Provided by : Canadian Centre for Occupational Health and Safety *
* Issue : 96-4 (November, 1996) *

*** IDENTIFICATION ***

REGISTRATION NUMBER	: 21917.00
PRODUCT NAME	: SIPHEX 30 CARPET & PREMISE PUMP INSECTICIDE
REGISTRANT	: JANSSEN PHARMACEUTICA (CODE: JAN) ATTN: MGR VET. MEDICAL AFFAIRS 1-6705 MILLCREEK DR. MISSISSAUGA ON L5N 5R9 TEL : 905-821-9161
CANADIAN AGENT	: CCL INDUSTRIES INC. (CODE: CCN) 190 LAKE DR. W. AJAX ON L1S 4Y2 TEL : 905-619-1094

*** REGISTRATION DATA ***

REGULATORY STATUS	: REGISTERED
DATE OF FIRST REGISTRATION	: 1992.09.15
METHOD OF APPLICATION	: CONTACT SPRAY (STRUCTURAL PEST CONTROL) RESIDUAL SPRAY (STRUCTURAL PEST CONTROL)
LOCATION OF USE	: DWELLINGS OUTDOOR SURFACES OF BUILDINGS
MARKETING TYPE	: DOMESTIC
PRODUCT GROUP	: ARTHROPOD AND MOLLUSC CONTROLS
PRODUCT TYPE	: ACARICIDE INSECTICIDE
FORMULATION TYPE	: SOLUTION
AERIAL APPLICATION	: UNSPECIFIED
ANTIMICROBIAL/TRADITIONAL GROUP	: TRADITIONAL
YEAR OF NEXT RE-REGISTRATION	: 1997

*** ACTIVE INGREDIENTS ***

INGREDIENT NAME :
D-TRANS ALLETHRIN (CODE: ALM)
GUARANTEED CONTENT : 0.050 %
CHEMICAL NAME :
(1RS)-3-ALLYL-2-METHYL-4-OXOCYCLOPENT-2-ENYL (1R)-TRANS-CHRYSANTHEMATE
CAS REGISTRY NUMBER : 584-79-2
LABEL AVAILABILITY : English Label available

*** ACTIVE INGREDIENTS ***

INGREDIENT NAME :
CHLORPYRIFOS (CODE: DUB)
GUARANTEED CONTENT : 0.500 %
CHEMICAL NAME :
O-O-DIETHYL O-3,5,6-TRICHLORO-2-PYRIDYL PHOSPHOROTHIOATE
CAS REGISTRY NUMBER : 2921-88-2

INGREDIENT NAME :
N-OCTYL BICYCLOHEPTENE DICARBOXIMIDE (CODE: MGK)
GUARANTEED CONTENT : 0.400 %
CHEMICAL NAME :
N-(2-ETHYLHEXYL)BICYCLO(2,2,1)-5-HEPTENE-2,3-DICARBOXIMIDE
CAS REGISTRY NUMBER : 113-48-4

*** LABEL TEXT ***

92.09.15

SIPHEX*30
CARPET AND PREMISE PUMP INSECTICIDE
VAPORISATEUR INSECTICIDE POUR TAPIS ET SURFACE
CONTACT AND RESIDUAL CARPET AND PREMISE SPRAY SPOT TREATMENT
TRAITEMENT LOCAL POUR TAPIS ET SURFACE QUI AGIT PAR CONTACT ET PAR EFFET RESIDUEL
A SPOT TREATMENT INSECTICIDE THAT KILLS FLEAS, ANTS, CARPET BEETLES, CRICKETS, EARWIGS, MILLIPEDES, COCKROACHES, SILVERFISH, SOWBUGS, SPIDERS AND BROWN DOG TICKS.
UN TRAITEMENT D'INSECTICIDE A L'ENDRIOT PRECIS DETRUIT PUCES, FOURMIS, ANTHRENES DE TAPIS, GRILLONS, PERCE-OREILLES, MILLE-PATTES, BLATTES, LEPISMES, PUNAISES, ARAIGNEES ET TIQUES BRUNES.
DOMESTIC/DOMESTIQUE
GUARANTEE/GARANTIE:
D-TRANS ALLETHRIN.....0.050%
N-OCTYL BICYCLOHEPTENE CARBOXIMIDE.....0.400%
CHLORPYRIFOS.....0.500%
NET CONTENTS 1 L CONTENU NET
SHAKE WELL BEFORE USING/BIEN AGITER LE CONTENANT
REG.NO. 21917 PCP ACT
NO.D'ENR. 21917 L.P.A.
READ LABEL BEFORE USING/LIRE L'ETIQUETTE AVANT L'EMPLOI
KEEP OUT OF REACH OF CHILDREN
CONSERVER HORS DE PORTEE DES ENFANTS
JANSSEN PHARMACEUTICA
6705 MILLCREEK DRIVE, MISSISSAUGA, ONTARIO L5N 5M4
SIPHEX*30 CARPET AND PREMISE PUMP IS FORMULATED FOR USE AS A

SPOT OR CRACK AND CREVICE TREATMENT TO CONTROL INSECTS LISTED ON THE FRONT PANEL.
INDOOR USE: For spot treatment of floors and floor coverings including carpets and broadloom as well as cracks, crevices, baseboards, underneath furniture and equipment, around garbage containers, localized areas of floors and floor coverings(spot treatment only) where insect habitat.
OUTDOOR USE: Spray outside surfaces of screens, doors, window frames, foundations, patios, light fixtures and other places where insect may alight, or congregate and enter.
DIRECTIONS: SHAKE CONTAINER WELL. Hold container upright approximately 30cm. from surface being sprayed and spray until wet. Test a small inconspicuous area of carpet for colour fastness. Thorough applications produce a coating which will vapourize into cracks and crevices for insect control. If reinfestations occur, repeat applications. PROVIDE ADEQUATE VENTILATION AFTER INDOOR USE. KEEP PETS AND CHILDREN AWAY UNTIL RESIDUE IS DRY.
PRECAUTIONS: KEEP OUT OF REACH OF CHILDREN. Harmful if swallowed, inhaled or absorbed through skin. Avoid contact with eyes, skin or clothing. DO NOT USE ON HUMANS, PLANTS, ANIMALS, FOOD STUFF, FOOD UTENSILS, FISHBOWLS OR ANIMAL FEED AREAS. DO NOT USE AS A SPACE SPRAY. DO NOT CONTAMINATE FOODSTUFFS. Do not use in areas where food is handled, prepared or stored. May cause skin and/or eye irritation. Product is very toxic to fish. Do not contaminate water by improper use or disposal.
FIRST AID TREATMENT: If swallowed, contact physician immediately. Chlorpyrifos is a cholinesterase inhibitor. Atropine is antidotal. In case of contact with the skin, wash with soap and water. If in eyes, flush with water 15 minutes, get medical attention.
DISPOSAL: When container is empty, dispose in household garbage.
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* REGULATORY INFORMATION ON PESTICIDE PRODUCTS *
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* Produced by : Agriculture and Agri-Food Canada *
* Provided by : Canadian Centre for Occupational Health and Safety *
* Issue : 96-4 (November, 1996) *

*** IDENTIFICATION ***

REGISTRATION NUMBER : 22970.00
PRODUCT NAME : OUR BRAND FLEA & TICK PREMISE SPRAY

REGISTRANT : OUR BRAND MANUFACTURING INC. (CODE: OUR)
5300 FAIRVIEW ST.
BURLINGTON ON
L7L 5N5
TEL : 416-639-7535

CANADIAN AGENT : WILSON LABORATORIES INC. (CODE: WIL)
36 HEAD ST.
DUNDAS ON
L9H 3H3
TEL : 905-639-7535

*** REGISTRATION DATA ***

REGULATORY STATUS : REGISTERED
DATE OF FIRST REGISTRATION : 1993.06.18
METHOD OF APPLICATION : RESIDUAL SPRAY (STRUCTURAL PEST CONTROL)
LOCATION OF USE : DWELLINGS
OUTDOOR SURFACES OF BUILDINGS
OUTDOOR LIVING AREAS
MARKETING TYPE : DOMESTIC
PRODUCT GROUP : ARTHROPOD AND MOLLUSC CONTROLS
PRODUCT TYPE : ACARICIDE
INSECTICIDE
FORMULATION TYPE : SOLUTION
AERIAL APPLICATION : UNSPECIFIED
ANTIMICROBIAL/TRADITIONAL GROUP : TRADITIONAL
YEAR OF NEXT RE-REGISTRATION : 1998

*** ACTIVE INGREDIENTS ***

INGREDIENT NAME :
D-TRANS ALLETHRIN (CODE: ALM)
GUARANTEED CONTENT : 0.500 %
CHEMICAL NAME :
(1RS)-3-ALLYL-2-METHYL-4-OXOCYCLOPENT-2-ENYL (1R)-TRANS-CHRYSANTHEMATE
CAS REGISTRY NUMBER : 584-79-2
LABEL AVAILABILITY : English Label available

*** ACTIVE INGREDIENTS ***

INGREDIENT NAME :
CHLORPYRIFOS (CODE: DUB)
GUARANTEED CONTENT : 0.500 %
CHEMICAL NAME :
O-O-DIETHYL O-3,5,6-TRICHLORO-2-PYRIDYL PHOSPHOROTHIOATE
CAS REGISTRY NUMBER : 2921-88-2

INGREDIENT NAME :
N-OCTYL BICYCLOHEPTENE DICARBOXIMIDE (CODE: MGK)
GUARANTEED CONTENT : 0.400 %
CHEMICAL NAME :
N-(2-ETHYLHEXYL)BICYCLO(2,2,1)-5-HEPTENE-2,3-DICARBOXIMIDE
CAS REGISTRY NUMBER : 113-48-4

*** LABEL TEXT ***

93.06.18

OUR BRAND
READY-TO-USE
INDOOR & OUTDOOR
Flea and Tick Premise Spray
A CONTACT AND RESIDUAL CRACK, CREVICE AND SURFACE SPRAY
KILLS AMERICAN (BROWN AND DOG) TICKS, AMERICAN
DOG AND CAT FLEAS AND OTHER CRAWLING INSECTS
INSIDE AND OUTSIDE THE HOME
DOMESTIC
REG. NO. 22970 P.C.P ACT

GUARANTEE: D-Trans Allethrin 0.050%
N-Octyl Bicycloheptene Dicarboximide 0.400%
Chlorpyrifos 0.500%

READ THE LABEL BEFORE USING
The Product with a Little Heart Built Right In
Manufactured for:
OUR BRAND MANUFACTURING INC.
Burlington, Ont. L7L 5N5

For use as a spot or crack and crevice treatment to control American Dog and Cat Fleas, American (Brown and Dog) Ticks, Earwigs, Ants, Cockroaches, Spiders, Sowbugs, Crickets Millipedes, Silverfish and Carpet Beetles.

INDOOR USE: Thoroughly treat cracks, crevices, baseboards, underneath furniture and equipment, around garbage containers, localized areas of floors and floor coverings and other places where insects habitat.

OUTDOOR USE: Spray outside surfaces of screens, doors, window frames, foundations, patios, light fixtures and other places where insects may alight, or congregate and enter.

DIRECTIONS: Apply with the hand trigger sprayer attached. Adjust nozzle for a coarse wetting spray. Hold container approximately 30 cm from surface being sprayed and spray until wet. Thorough applications produce a coating which will vapourize into cracks and crevices for insect control. If reinfestations occur, repeat applications as necessary. Provide adequate ventilation after indoor use. KEEP PETS AND CHILDREN AWAY FROM SURFACE UNTIL DRY.

PRECAUTION: KEEP OUT OF REACH OF CHILDREN. Harmful if swallowed, inhaled, or absorbed through skin. Avoid contact with eyes, skin or clothing. DO NOT USE ON HUMANS, PLANTS, ANIMALS, FOOD STUFF, FOOD UTENSILS, FISHBOWLS OR ANIMAL FEED AREAS. DO NOT USE AS A SPACE SPRAY. DO NOT CONTAMINATE FOODSTUFFS. Do not use in any area where food may be exposed. Do not use in bulk food storage areas. Do not use in cupboards where food or cooking utensils are stored. In homes or dwellings, remove or cover all exposed food and cooking utensils before spraying. Thoroughly wash all surfaces that might contact food before reuse.

FIRST AID: Contains volatile petroleum distillate. If swallowed, do not induce vomiting. Call physician immediately. In case of contact with the skin, wash with soap and water. If in eyes, flush with water for 15 minutes, get medical attention.

TOXICOLOGICAL INFORMATION: Chlorpyrifos is a cholinesterase inhibitor. Atropine is antidotal.

DISPOSAL: Dispose of empty container with regular garbage. Do not reuse.

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* *
* REGULATORY INFORMATION ON PESTICIDE PRODUCTS *
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* Produced by : Agriculture and Agri-Food Canada *
* Provided by : Canadian Centre for Occupational Health and Safety *
* Issue : 96-4 (November, 1996) *

*** IDENTIFICATION ***

REGISTRATION NUMBER	: 23075.00
PRODUCT NAME	: ZODIAC ENDALSECT (TM) PREMISE PLUS FLEA SPRAY
REGISTRANT	: SANDOZ AGRO CANADA INC. (CODE: SDZ) SUITE 302, PLAZA 4 2000 ARGENTIA RD. MISSISSAUGA ON L5N 1W1 TEL : 905-821-7850

*** REGISTRATION DATA ***

REGULATORY STATUS	: REGISTERED
DATE OF FIRST REGISTRATION	: 1993.06.28
METHOD OF APPLICATION	: CONTACT SPRAY (STRUCTURAL PEST CONTROL) RESIDUAL SPRAY (STRUCTURAL PEST CONTROL)
LOCATION OF USE	: DWELLINGS
MARKETING TYPE	: DOMESTIC
PRODUCT GROUP	: ARTHROPOD AND MOLLUSC CONTROLS
PRODUCT TYPE	: ACARICIDE INSECT GROWTH REGULATOR INSECTICIDE
FORMULATION TYPE	: SOLUTION
AERIAL APPLICATION	: UNSPECIFIED
ANTIMICROBIAL/TRADITIONAL GROUP	: TRADITIONAL
YEAR OF NEXT RE-REGISTRATION	: 1998

*** ACTIVE INGREDIENTS ***

INGREDIENT NAME :
METHOPRENE (CODE: MPR)

GUARANTEED CONTENT	: 0.007 %

CHEMICAL NAME :
ISOPROPYL (E,E) 11-METHOXY-3,7,11-TRIMETHYL-2,4-DODECADIENOATE

CAS REGISTRY NUMBER	: 40596-69-8
LABEL AVAILABILITY	: English Label available

*** ACTIVE INGREDIENTS ***

INGREDIENT NAME :
PERMETHRIN (CODE: PFL)
GUARANTEED CONTENT : 0.250 %
CHEMICAL NAME :
3-PHENOXYBENZYL (1 RS, 3RS)-(1 RS, 3
SR)-3-(2,2-DICHLOROVINYL)-2,2-DIMETHYL-CYCLOPROPANECARBOXYLATE
CAS REGISTRY NUMBER : 52645-53-1

*** LABEL TEXT ***

93.06.28

ZODIAC(R)
ENDALSECT
PREMISE FLEA SPRAY PLUS
VAPORISATION ANTI-PUCES POUR LOCAUX PLUS
WITH PRECOR(TM) INSECT GROWTH REGULATOR
KILLS ADULT AND PRE-ADULT FLEAS.
PROVIDES 6 MONTHS RESIDUAL ACTION AGAINST PRE-ADULT FLEAS.
AVEC LE REGULATEUR DE CROISSANCE DES INSECTES PRECOR(MD)
TUE LES PUCES ADULTES ET PRE-ADULTES.
EFFET RESIDUEL DE 6 MOIS JOURS CONTRE LES PUCES PRE-ADULTES.
KEEP OUT OF REACH OF CHILDREN
READ THE LABEL BEFORE USING
TENIR HORS DE LA PORTEE DES ENFANTS
LIRE L'ETIQUETTE AVANT L'USAGE
GUARANTEE/GARANTIE
(S)-METHOPRENE 0.007%
PERMETHRIN 0.25%
REG.NO./NO.D'ENR. 23075 P.C.P. ACT/L.P.A.
DOMESTIC/DOMESTIQUE
DOUBLE ACTION
946 mL
SANDOZ AGRO CANADA, INC.
SUITE 302, PLAZA 4, 2000 ARGENTIA ROAD
MISSISSAUGA, ONTARIO L5N 1W1
PHONE: 1-800-688-7378

ZODIAC and PRECOR are REGISTERED TRADEMARKS and ENDALSECT is a TRADEMARK of SANDOZ LTD.

ENDALSECT(TM) PREMISE SPRAY kills adult and pre-adult dog and cat fleas. It contains a unique combination of ingredients, permethrin and Precor(R). The permethrin kills adult fleas, brown dog and American dog ticks, cockroaches, silverfish, earwigs and ants. Precor, an insect growth regulator, kills the pre-adult fleas present in the house for 6 months. It controls fleas hidden in carpets, rugs, drapes, upholstery and pet bedding. Endalsect Premise Plus leaves no bad smell, no sticky mess and will not stain furnishings. Because of the long term flea control provided by Endalsect Premise Plus, regular use of this product will reduce the need for topical treatment of pets for ectoparasites.

DIRECTIONS FOR USE: SHAKE WELL BEFORE USING

For effective flea control, adjust the spray nozzle to create a fine mist and apply uniformly without wetting furniture and carpeting. This product is designed for use on all fabrics and carpeting, however, some natural fibres(such as wool) and synthetics may be adversely affected by any liquid product - always test a hidden area prior to use. One 946 mL bottle

will treat approximately 37 square metres(400 sq.ft.). Do not use as a space spray. Care should be used when treating wood surfaces, as water spotting may occur. Re-treat as necessary. Be sure to treat pet bedding and other resting places, as these are primary hiding places for fleas and ticks. No need to remove pet bedding after treatment. DO NOT USE ON PETS. To kill cockroaches, ticks, silverfish, earwigs and ants, apply directly to pests.

PRECAUTIONARY STATEMENTS: KEEP OUT OF REACH OF CHILDREN. May be harmful if swallowed or absorbed through skin. Avoid breathing spray. Avoid contact with skin, eyes or clothing. Wash thoroughly after handling. Do not allow children or pets to walk on treated surface until completely dry. Do not spray on animals, humans, plants, foodstuffs, food utensils, fish bowls or animal feed areas. Do not contaminate foodstuffs. Do not use in food serving areas while food is exposed. Thoroughly wash all surfaces that might be in contact with food before re-use.

FIRST AID

IF ON SKIN: Remove contaminated clothing and wash affected areas with soap and water. IF IN EYES: Flush eyes with plenty of water. Call a physician if irritation persists. IF SWALLOWED: Drink 1 or 2 glasses of water and induce vomiting by touching finger to back of throat. Never give anything by mouth to an unconscious or convulsing person. Seek medical attention immediately.

STORAGE - DISPOSAL

Store in original container, away from children. Protect from freezing or high temperatures. Do not re-use empty container. Wrap empty container and place in household garbage.

NOTICE TO BUYER

Seller's guarantee shall be limited to the terms set out on the label and, subject thereto, the buyer assumes the risk to persons or property arising from the use or handling of this product and accepts the product on the condition.

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* REGULATORY INFORMATION ON PESTICIDE PRODUCTS *
* *
* Produced by : Agriculture and Agri-Food Canada *
* Provided by : Canadian Centre for Occupational Health and Safety *
* Issue : 96-4 (November, 1996) *

*** IDENTIFICATION ***

REGISTRATION NUMBER : 15695.00
PRODUCT NAME : SOREXA CR-2 SUPER MOUSE & RAT BAIT
REGISTRANT : CIBA-GEIGY CANADA LTD. (CODE: CGC)
6860 CENTURY AVE.
MISSISSAUGA ON
L5N 2W5
TEL : 905-821-4420

*** REGISTRATION DATA ***

REGULATORY STATUS : REGISTERED
DATE OF FIRST REGISTRATION : 1979
METHOD OF APPLICATION : BAIT
LOCATION OF USE : DWELLINGS
FARM BUILDINGS
FOOD/FEED ESTABLISHMENTS
INDUSTRIAL ESTABLISHMENTS
NONFABRIC/NONFOOD COMMODITIES (STORED)
MARKETING TYPE : COMMERCIAL
PRODUCT GROUP : VERTEBRATE PEST CONTROLS
PRODUCT TYPE : RODENTICIDE
FORMULATION TYPE : PARTICULATE
AERIAL APPLICATION : UNSPECIFIED
ANTIMICROBIAL/TRADITIONAL GROUP : TRADITIONAL
YEAR OF NEXT RE-REGISTRATION : 1997

*** ACTIVE INGREDIENTS ***

INGREDIENT NAME :
ERGOCALCIFEROL (CODE: EGO)
GUARANTEED CONTENT : 0.1 %
CHEMICAL NAME :
VITAMIN D2
CAS REGISTRY NUMBER : 50-14-6
LABEL AVAILABILITY : English Label available

*** ACTIVE INGREDIENTS ***

INGREDIENT NAME :
WARFARIN PRESENT IN FREE FORM OR AS SODIUM SALT (CODE: WAR)
GUARANTEED CONTENT : 0.025 %
CHEMICAL NAME :
4-HYDROXY-3-(3-OXO-1-PHENYLBUTYL) COUMARIN
CAS REGISTRY NUMBER : 81-81-2

*** LABEL TEXT ***

92.02.16

SOREXA (R) CR-2

INDUSTRIAL
SUPER MOUSE AND RAT BAIT
READY-TO-USE IMPREGNATED CANARY SEED
Net Weight: 10 kg
GUARANTEE:
Calciferol 0.1%
Warfarin 0.025%
READ THE LABEL BEFORE USING
REGISTRATION NO.: 15695
PEST CONTROL PRODUCTS ACT
CIBA-GEIGY CANADA LTD.
Agricultural Division
6860 Century Avenue
Mississauga, Ontario
L5N 2W5
Effective against warfarin-resistant mice and rats.
For use in processing plants (food, feed, non-food), food service establishments, storage areas (food, feed, non-food), dwellings and buildings (commercial, agricultural).
DIRECTIONS:
Lay 30 g baits in many locations throughout the infested area, in locations where mice feed/water and/or travel. For rats, bait stations should contain 90 - 150 g. Out-of-doors baits should be sheltered from rain by covering with boards, drain pipes, tiles, etc. Wet baits will become inactive. Contaminated or spoiled baits should be replaced promptly.
BEWARE OF SETTING OUT TOO LITTLE BAIT.
Inspect baits daily. The first three days are critical; it is essential that baits are kept topped up with fresh material. It takes several days of feeding to build up lethal levels.
Ensure that all baits are protected so that access by domestic animals, particularly CATS, DOGS and PIGS, is impossible.
WARNING:
In food processing plants and food service establishments, place baits when facility is not in operation and avoid contamination of food stuffs or food handling equipment or surfaces. Remove or cover all food packaging materials and utensils before placing baits. Wash any food contact surfaces which become accidentally contaminated. Remove all baits and dead rodents before re-use of the plant for food processing.
PRECAUTIONS:
KEEP OUT OF REACH OF CHILDREN, pets and farm animals. AVOID ALL CONTACT BY MOUTH. Wash hands after using and before eating, drinking or smoking. Do not contaminate food, feed or water. Remove all remains of bait after treatment and bury. Search for and bury all rodent bodies. Store in original container in a safe place away from moisture and sources of heat. Do not re-use empty container. Dispose of in garbage in accordance with municipal requirements.
FIRST AID:
If on skin, wash with soap and water. If swallowed, induce vomiting. Obtain prompt medical attention.
TOXICOLOGICAL INFORMATION:
Peritoneal dialysis with a calcium-free electrolyte solution to which 4% glucose is added is advised.
NOTICE TO USER:
This control product is to be used only in accordance with the directions on this label. It is an offence under the PEST CONTROL PRODUCTS ACT to use a control product under unsafe conditions.
NOTICE TO BUYER:

Seller's guarantee shall be limited to the terms set out on the label and subject thereto, the buyer assumes the risk to persons or property arising from the use or handling of this product and accepts the product on that condition.
(R) Sorexa is a Registered Trademark CIBA-GEIGY CANADA LTD.
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* REGULATORY INFORMATION ON PESTICIDE PRODUCTS *
*
* Produced by : Agriculture and Agri-Food Canada *
* Provided by : Canadian Centre for Occupational Health and Safety *
* Issue : 96-4 (November, 1996) *

*** IDENTIFICATION ***

REGISTRATION NUMBER : 17940.00
PRODUCT NAME : FURADAN CR-10 SYSTEMIC INSECTICIDE
REGISTRANT : MILES CANADA INC. (CODE: CHH)
77 BELFIELD RD.
ETOBICOKE ON
M9W 1G6
TEL : 416-614-1053

*** REGISTRATION DATA ***

REGULATORY STATUS : REGISTERED
DATE OF FIRST REGISTRATION : 1983.12.19
METHOD OF APPLICATION : SOIL APPLICATION
LOCATION OF USE : FOOD/FEED CROPS (FIELD)
MARKETING TYPE : COMMERCIAL
PRODUCT GROUP : ARTHROPOD AND MOLLUSC CONTROLS
PRODUCT TYPE : INSECTICIDE
FORMULATION TYPE : GRANULAR
AERIAL APPLICATION : UNSPECIFIED
ANTIMICROBIAL/TRADITIONAL GROUP : TRADITIONAL
YEAR OF NEXT RE-REGISTRATION : 1995

*** ACTIVE INGREDIENTS ***

INGREDIENT NAME :
CARBOFURAN (CODE: CAF)
GUARANTEED CONTENT : 10 %
CHEMICAL NAME :
2,3-DIHYDRO-2,2-DIMETHYL BENZOFURAN-7-YL METHYLCARBAMATE
CAS REGISTRY NUMBER : 1563-66-2
LABEL AVAILABILITY : English Label available

*** LABEL TEXT ***

90.01.30

FURADAN(R) CR-10
SYSTEMIC INSECTICIDE
Contains Carbofuran
COMMERCIAL
GUARANTEE: Carbofuran.....10%
NET WEIGHT 20 KILOGRAMS
REGISTRATION NO. 17940
PEST CONTROL PRODUCTS ACT
FURADAN is a registered trademark of FMC Corporation
D A N G E R P O I S O N
KEEP OUT OF REACH OF CHILDREN
READ THE LABEL BEFORE USING
Call a doctor in case of accident
DISTRIBUTED BY
CHEMAGRO LIMITED
256 Britannia Road East
Mississauga, Ontario, Canada L4Z 1S6

NOTICE TO USER: This control product is to be used only in accordance with the directions on this label. It is an offense under the PEST CONTROl. PRODUCTS ACT to use a control product under unsafe conditions.

DIRECTIONS FOR USE

Read entire label and follow directions closely.
Do not handle this product with bare hands.

CROP	INSECT	DOSAGE FURADAN CR-10	REMARKS
Rapeseed and Mustard	Flea beetles	2.8 kg/ha	For maximum flea beetle control apply a mixture of FURADAN CR-10 granules and seed preferably with a hoe or press drill. Do not use disc-type seeding equipment. Harrowing after seeding causes loss of efficacy. Mix 2.8 kg of FURADAN CR-lo granules with the seed to be sown per hectare. EXAMPLE: If 7.75 kg of seed is sown per hectare, mix it with 2.8 kg of FURADAN CR-10 (total weight 10.55 kg). The FURADAN CR-10 granules and seed should be thoroughly mixed using a customary mechanical method. BEFORE SEEDING ADJUST THE FLOW FROM THE SPOUTS SO THAT THE REQUIRED WEIGHT OF SEED AND FURADAN CR-10 IS SOWN PER HECTARE. Check fields shortly after rapeseed emerges. Under certain conditions, a follow-up foliar treatment may be necessary. FURADAN(R) 480 Flowable and (R)GUTHION are insecticides which may be used. If seed decay, seedling blight, and damping-off diseases are a problem, treat seed with a recommended fungicide.

DANGER
Poisonous by swallowing or inhalation. Do not breathe dust. Do not get in eyes. Wear goggles when exposed to dust. In case breathing of dust during handling cannot be avoided, use a respirator of a type suitable for carbofuran protection such as American Optical Respirator 6058

(filter-cartridges R58) or Willson Agritox Respirator (Cartridge 11P, filter R553). Do not apply or allow to drift to areas occupied by unprotected humans or beneficial animals. Do not contaminate feed or foodstuffs. Keep out of areas inhabited by fish, birds, and wildlife, as this product is highly toxic to such animals.
FIRST AID: IF SWALLOWED, vomiting should be induced. Administer water freely and induce vomiting by giving one dose (15 mL) of syrup of ipecac. If vomiting does not occur within 10 to 20 minutes, administer second dose. If syrup of ipecac is not available, induce vomiting by sticking finger down throat. Repeat until vomit fluid is clear. The patient should be lying down with the head below the foot level and facing down or to one side. Professional medical assistance should be secured immediately. DO NOT INDUCE VOMITING TO AN UNCONSCIOUS PERSON OR TO PERSONS IN A CONVULSIVE STATE. IF INHALED, have victim lie down and remain quiet. IF ON SKIN, remove contaminated clothing and immediately wash skin with soap and water. IF IN EYES, flush eyes immediately with plenty of water for at least 15 minutes. Call a doctor immediately.
TOXICOLOGICAL INFORMATION: Symptoms of poisoning are headache, light-headedness, weakness, nausea, constriction of pupils, blurred vision, cramps, salivation, diarrhea, vomiting. Carbofuran is a reversible cholinesterase inhibitor. Give atropine 2 mg intramuscularly. If in eyes instill one drop of Homatropine. Do not use oximes such as 2-PAM.
DISPOSAL OF EMPTY CONTAINER: Do not reuse container. Completely empty the contents into the pesticide hopper. Make the empty container unsuitable for further use. Dispose of the container in accordance with provincial requirements but DO NOT BURN. For information on the disposal of' unused, unwanted product and the cleanup of spills, contact the regional office of Conservation and Protection, Environment Canada.
NOTICE
Seller's guarantee shall be limited to the terms set out on the label and, subject thereto, the buyer assumes the risk to persons or property arising from the use or handling of this product and accepts the product on that condition.
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* REGULATORY INFORMATION ON PESTICIDE PRODUCTS *
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* Produced by : Agriculture and Agri-Food Canada *
* Provided by : Canadian Centre for Occupational Health and Safety *
* Issue : 96-4 (November, 1996) *

*** IDENTIFICATION ***

REGISTRATION NUMBER : 18175.00
PRODUCT NAME : FURADAN CR-10 SYSTEMIC INSECTICIDE
REGISTRANT : FMC CORP. (CODE: FMC)

AGRICULTURAL CHEMICAL DIV.
1735 MARKET ST.
PHILADELPHIA PA
USA 19103
TEL : 215-299-6000

*** REGISTRATION DATA ***

REGULATORY STATUS	: REGISTERED
DATE OF FIRST REGISTRATION	: 1985.01.30
METHOD OF APPLICATION	: SOIL APPLICATION
LOCATION OF USE	: FOOD/FEED CROPS (FIELD)
MARKETING TYPE	: COMMERCIAL
PRODUCT GROUP	: ARTHROPOD AND MOLLUSC CONTROLS
PRODUCT TYPE	: INSECTICIDE
FORMULATION TYPE	: GRANULAR
AERIAL APPLICATION	: UNSPECIFIED
ANTIMICROBIAL/TRADITIONAL GROUP	: TRADITIONAL
YEAR OF NEXT RE-REGISTRATION	: 1995

*** ACTIVE INGREDIENTS ***

INGREDIENT NAME :
CARBOFURAN (CODE: CAF)
GUARANTEED CONTENT : 10 %
CHEMICAL NAME :
2,3-DIHYDRO-2,2-DIMETHYL BENZOFURAN-7-YL METHYLCARBAMATE
CAS REGISTRY NUMBER : 1563-66-2
LABEL AVAILABILITY : English Label available

*** LABEL TEXT ***

88.03.24

MASTER LABEL
FURADAN(R) CR-10
SYSTEMIC INSECTICIDE
Contains Carbofuran
COMMERCIAL
NET WEIGHT _____ KILOGRAMS
GUARANTEE: Carbofuran 10%
REGISTRATION NO. 18175
PEST CONTROL PRODUCTS ACT
FURADAN(R) is a registered trademark of FMC Corporation
D A N G E R P 0 I S 0 N
KEEP OUT OF REACH OF CHILDREN
(See Rear Panel for Additional Danger Statements)
READ THE LABEL BEFORE USING
FMC CORPORATION
Agricultural Chemical Group
2000 Market Street
Philadelphia, Pennsylvania 19103
USA

NOTICE TO USER : This control product is to be used only in accordance with the directions on this label. It is an offence under the Pest Control Products Act to use a control product under unsafe conditions.

DIRECTIONS FOR USE

Read entire label and follow directions closely.
Do not handle this product with bare hands.

CROP	INSECT	DOSAGE FURADAN CR-10	REMARKS
Rape and Mustard	Flea Beetles	2.8 kg/ha.	For maximum flea beetle control, apply a mixture of BAN CR-10 and seed preferably with a hoe or press drill. Do not use disc-type seeding equipment. Harrowing after seeding causes loss of efficacy. Mix 2.8 kg of FURADAN CR-10 with the seed to be sown per ha. Example: If 7.75 kg of seed is sown per hectare, mix with 2.8 kg of BAN (total weight 10.55 kg). The FURADAN granules and seed should be thoroughly mixed using a customary mechanical method. BEFORE SEEDING, ADJUST THE FLOW FROM THE SPOUTS SO THAT THE REQUIRED WEIGHT OF SEED AND -AH CR-10 IS SOWN PER HECTARE. Check fields shortly after rape emerges. Under certain conditions, a follow-up foliar treatment may be necessary. BAN 480 Flowable and GUTHION are insecticides which may be used. If seed decay, seedling blight, and damping-off diseases are a problem, treat seed with a recommended fungicide.

DANGER

Poisonous by swallowing or inhalation. Do not breathe dust. Do not get in eyes. Wear goggles when exposed to dust. In case breathing of dust during handling cannot be avoided, use a respirator of a type suitable for BAN protection such as American Optical Respirator 6058 (filter-cartridges R58) or Willson Agritox Respirator (Cartridge 11P, filter R553). Do not apply or allow to drift to areas occupied by unprotected humans or beneficial animals. Do not contaminate feed or foodstuffs. Keep out of areas inhabited by fish, birds and wildlife, as this product is highly toxic to such animals.

POISON

Call a doctor in case of accident
KEEP OUT OF REACH OF CHILDREN

For Emergency Assistance Call 716-735-3765

First Aid

If swallowed, drink 1 or 2 glasses of water and induce vomiting by touching back of throat with finger or blunt object. Do not induce vomiting or give anything by mouth to an unconscious person. Get medical attention.

If inhaled, remove victim to fresh air. Have victim lie down and remain quiet. If not breathing, give artificial respiration, preferably mouth-to-mouth. Get medical attention.
If in eyes, flush with plenty of water for at least 15 minutes. Get medical attention.
If on skin. In case of contact, remove contaminated clothing and immediately wash skin with soap and water.
TOXICOLOGICAL INFORMATION: Symptoms of poisoning are headache, light-headedness, weakness, nausea, constriction of pupils, blurred vision, cramps, salivation, diarrhea, vomiting. Furadan is a reversible cholinesterase inhibitor. Do not use oximes such as 2-PAM. Start by giving 2 mg. atropine intramuscularly. According to clinical response, continue until signs of atropinization occur (dry mouth or dilated pupils). If in eyes, instill one drop of homatropine.
DISPOSAL OF EMPTY CONTAINER: Do not reuse the container. Completely empty the contents and bury the unused chemical at least 0.5 m deep in an isolated location away from any water supply. Burn the empty container completely. Exercise caution and stay well away from the smoke.

NOTICE

Seller's guarantee shall be limited to the terms set out on the label and, subject thereto, the buyer assumes the risk to persons or property arising from the use of handling of this product and accepts the product on that condition.
Made and Printed in U.S.A.
EPA Est. 279-_____

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* REGULATORY INFORMATION ON PESTICIDE PRODUCTS *
*
* Produced by : Agriculture and Agri-Food Canada *
* Provided by : Canadian Centre for Occupational Health and Safety *
* Issue : 96-4 (November, 1996) *

*** IDENTIFICATION ***

REGISTRATION NUMBER : 16693.00
PRODUCT NAME : SIGNATURE POOL CHLORINATING LIQUID

*** REGISTRATION DATA ***

REGULATORY STATUS	: HISTORICAL
DATE OF FIRST REGISTRATION	: 1980.10.02
DATE OF LAST REGISTRATION	: 90.12.31
METHOD OF APPLICATION	: ADDITION TO WATER OR TO AQUEOUS SYSTEMS
LOCATION OF USE	: WATER (SWIMMING AND WADING POOLS)
MARKETING TYPE	: DOMESTIC
PRODUCT GROUP	: SWIMMING POOL CHEMICALS
PRODUCT TYPE	: SWIMMING POOL ALGICIDE SWIMMING POOL BACTERICIDE
FORMULATION TYPE	: SOLUTION
AERIAL APPLICATION	: UNSPECIFIED
ANTIMICROBIAL/TRADITIONAL GROUP	: ANTIMICROBIAL
REASON FOR DISAPPEARANCE	: NOT ELIGIBLE FOR REGISTRATION

*** ACTIVE INGREDIENTS ***

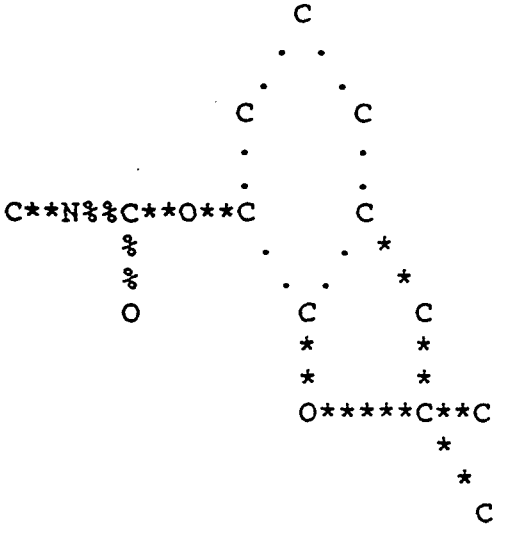
INGREDIENT NAME :
SODIUM HYPOCHLORITE (CODE: SHC)
GUARANTEED CONTENT : 10.8 %
CHEMICAL NAME :
SODIUM HYPOCHLORITE
CAS REGISTRY NUMBER : 7681-52-9

1 - TSCAINV (TSCA Inventory)
5 - OHM/TADS (Oil and Hazardous Materials): 7800023
7 - Merck Index: 1810
32 - RTECS (Reg. of Toxic Effects of Chem. Substances): FB9450000
37 - CHRIS (Chemical Hazards Response Info System): CBF
50 - CTCP, Product Formulation Information
51 - TSCAPP (TSCA Plant and Production)
56 - TSCATS (TSCA Test Submissions)
60 - WMSSS (Wiley Registry of Mass Spectral Data)
63 - CTCP, Toxicity Statement Information
213 - GIABS (Gastro-Intestinal Absorptivity)
214 - PHYTOTOX (Plant Toxicity)
215 - IFIS (EPA Industry Specific Regulations)
216 - CASR (EPA Chemical Activities)
217 - GENETOX (Genetic Assay Studies)
218 - ISHOW (Physical Properties)
219 - ENVIROFATE (Environmental Fate)
220 - AQUIRE (Aquatic Toxicity)
221 - DERMAL (Dermal Absorption)
225 - IRIS (Integrated Risk Information System)
227 - ERNS (Emergency Response Notification System)
229 - CHEMHAZIS (Chemical Hazard Information System)
231 - BIOLOG (Biodegradation Bibliographic References)
232 - DATALOG (Environmental Fate References)

29 Non-CIS References Available

CR BCFND
AS CARBO
FURAN

C12H15NO3



7-Benzofuranol, 2,3-dihydro-2,2-dimethyl-, methylcarbamate (9CI)
Carbamic acid, methyl-, 2,3-dihydro-2,2-dimethyl-7-benzofuranyl ester (8CI)
BAY 70143
BAY 78537
C2292-59a

41 more names available

78 more names available

Option? sshow 2

Entry: 1

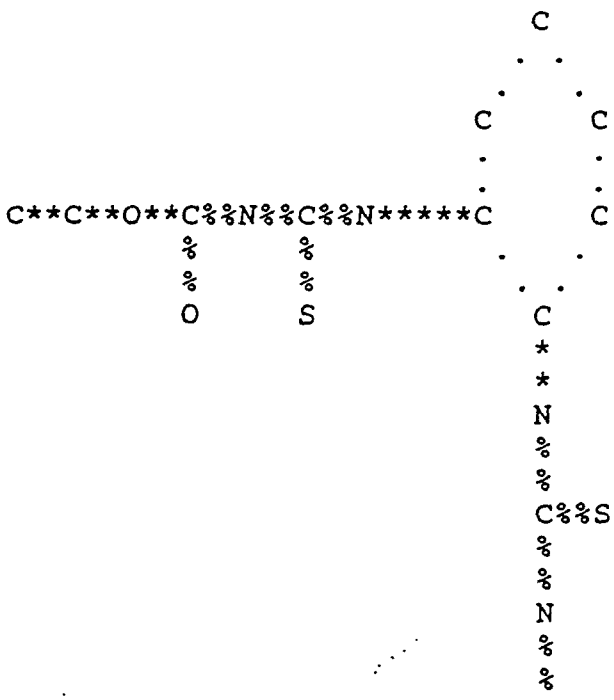
CAS RN 23564-06-9

CIS Sources of Information

7 - Merck Index: 9282
32 - RTECS (Reg. of Toxic Effects of Chem. Substances): BA3650000
60 - WMSSS (Wiley Registry of Mass Spectral Data)
63 - CTCP, Toxicity Statement Information
213 - GIABS (Gastro-Intestinal Absorptivity)
214 - PHYTOTOX (Plant Toxicity)
215 - IFIS (EPA Industry Specific Regulations)
216 - CASR (EPA Chemical Activities)
217 - GENETOX (Genetic Assay Studies)
220 - AQUIRE (Aquatic Toxicity)
231 - BIOLOG (Biodegradation Bibliographic References)
232 - DATALOG (Environmental Fate References)

14 Non-CIS References Available

C14H18N4O4S2



THIOPHANATE

TOPS 11

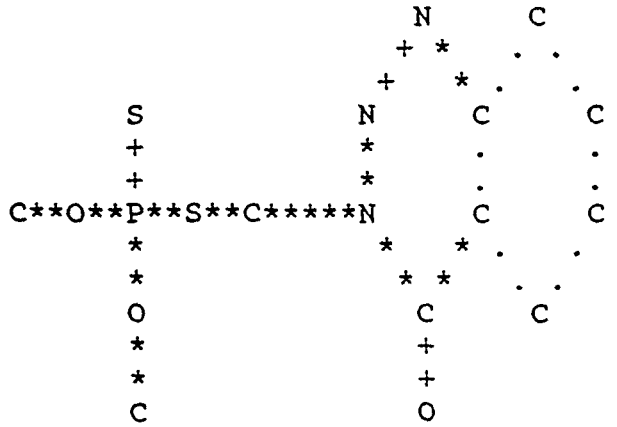
CIS Sources of Information

5 - OHM/TADS (Oil and Hazardous Materials): 7216525
7 - Merck Index: 926
32 - RTECS (Reg. of Toxic Effects of Chem. Substances): TE1925000
37 - CHRIS (Chemical Hazards Response Info System): AZM
50 - CTCP, Product Formulation Information
56 - TSCATS (TSCA Test Submissions)
60 - WMSSS (Wiley Registry of Mass Spectral Data)
63 - CTCP, Toxicity Statement Information
120 - CCRIS (Carcinogenicity Studies)
213 - GIABS (Gastro-Intestinal Absorptivity)
214 - PHYTOTOX (Plant Toxicity)
215 - IFIS (EPA Industry Specific Regulations)
216 - CASR (EPA Chemical Activities)
217 - GENETOX (Genetic Assay Studies)
218 - ISHOW (Physical Properties)
219 - ENVIROFATE (Environmental Fate)
220 - AQUIRE (Aquatic Toxicity)
221 - DERMAL (Dermal Absorption)
225 - IRIS (Integrated Risk Information System)
227 - ERNS (Emergency Response Notification System)
229 - CHEMHAZIS (Chemical Hazard Information System)
230 - BIODEG (Biodegradation of Substances)
231 - BIOLOG (Biodegradation Bibliographic References)
232 - DATALOG (Environmental Fate References)

GUTHION

38 Non-CIS References Available

C10H12N3O3PS2



Phosphorodithioic acid, O,O-dimethyl S-[(4-oxo-1,2,3-benzotriazin-3(4H)-yl)methyl] ester (9CI)
Phosphorodithioic acid, O,O-dimethyl ester, S-ester with 3-(mercaptomethyl)-1,2,3-benzotriazin-4(3H)-one (8CI)

2H-1-Benzopyran-2-one, 4-hydroxy-3-(3-oxo-1-phenylbutyl)- (9CI)
Coumarin, 3-(.alpha.-acetonylbenzyl)-4-hydroxy- (8CI)
3-(Acetonylbenzyl)-4-hydroxycoumarin
3-(Alpha-acetonylbenzyl)-4-hydroxycoumarin
3-(.alpha.-Acetonylbenzyl)-4-hydroxycoumarin (ACN)

97 more names available

Option?

Option? sshow 4

Entry: 1

CAS RN 81-81-2

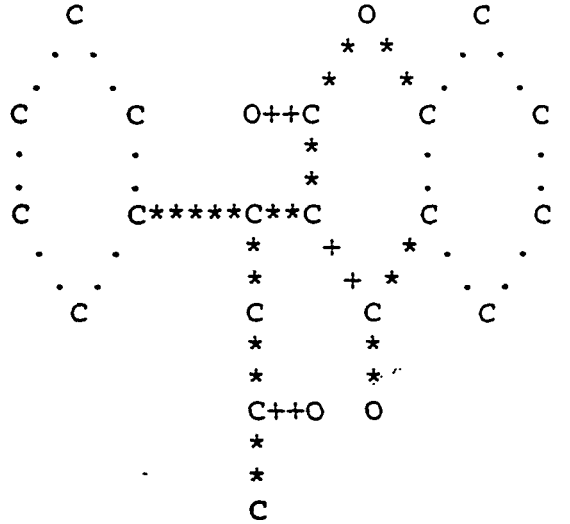
CIS Sources of Information

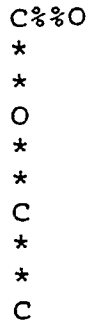
1 - TSCAINV (TSCA Inventory)
5 - OHM/TADS (Oil and Hazardous Materials): 8400261
7 - Merck Index: 9950
32 - RTECS (Reg. of Toxic Effects of Chem. Substances): GN4550000
50 - CTCP, Product Formulation Information
51 - TSCAPP (TSCA Plant and Production)
56 - TSCATS (TSCA Test Submissions)
60 - WMSSS (Wiley Registry of Mass Spectral Data)
63 - CTCP, Toxicity Statement Information
213 - GIABS (Gastro-Intestinal Absorptivity)
215 - IFIS (EPA Industry Specific Regulations)
216 - CASR (EPA Chemical Activities)
218 - ISHOW (Physical Properties)
219 - ENVIROFATE (Environmental Fate)
220 - AQUIRE (Aquatic Toxicity)
221 - DERMAL (Dermal Absorption)
225 - IRIS (Integrated Risk Information System)
229 - CHEMHAZIS (Chemical Hazard Information System)
231 - BIOLOG (Biodegradation Bibliographic References)
232 - DATALOG (Environmental Fate References)

CR BLEND AS WARFARIN

29 Non-CIS References Available

C19H16O4





Carbamic acid, [1,2-phenylenebis(iminocarbonothioyl)]bis-, diethy
l ester (9CI)
Allophanic acid, 4,4'-o-phenylenebis[3-thio-, diethyl ester (8CI)
3336-F
BAS 3220
1,2-Bis(ethoxycarbonylthioureido)benzene

35 more names available

Option? sshow 3

Entry: 1

CAS RN 39148-24-8

CIS Sources of Information

7 - Merck Index: 4167
32 - RTECS (Reg. of Toxic Effects of Chem. Substances): SZ9640000
56 - TSCATS (TSCA Test Submissions)
216 - CASR (EPA Chemical Activities)
225 - IRIS (Integrated Risk Information System)
232 - DATALOG (Environmental Fate References)

1 Non-CIS References Available

ALLIETTE

C6H18O9P3.Al

Structure information not available for this compound.

32545 Rp
Aliette
Aluminum Phosethyl
Aluminum tris(o-ethyl phosphonate)
Efosite Aluminum

7 more names available

Option? sshow 5

Entry: 1

CAS RN 16752-77-5

CIS Sources of Information

5 - OHM/TADS (Oil and Hazardous Materials): 8100100
7 - Merck Index: 5905
32 - RTECS (Reg. of Toxic Effects of Chem. Substances): AK2975000
50 - CTCP, Product Formulation Information
56 - TSCATS (TSCA Test Submissions)
60 - WMSSS (Wiley Registry of Mass Spectral Data)
63 - CTCP, Toxicity Statement Information
213 - GIABS (Gastro-Intestinal Absorptivity)
214 - PHYTOTOX (Plant Toxicity)
215 - IFIS (EPA Industry Specific Regulations)
216 - CASR (EPA Chemical Activities)
217 - GENETOX (Genetic Assay Studies)
218 - ISHOW (Physical Properties)
219 - ENVIROFATE (Environmental Fate)
220 - AQUIRE (Aquatic Toxicity)
221 - DERMAL (Dermal Absorption)
225 - IRIS (Integrated Risk Information System)
227 - ERNS (Emergency Response Notification System)
231 - BIOLOG (Biodegradation Bibliographic References)
232 - DATALOG (Environmental Fate References)

LANNATE METHOMYL

22 Non-CIS References Available

C5H10N2O2S

C**S**C++N**O**C%%N**C
* %
* %
C O

Ethanimidothioic acid, N-[[(methylamino)carbonyl]oxy]-, methyl ester (9CI)
Acetimidic acid, N-[(methylcarbamoyl)oxy]thio-, methyl ester (8CI)
Acetimidic acid, thio-N-[(methylcarbamoyl)oxy]-, methyl ester
Acetimidothioic acid, methyl-, N-(methylcarbamoyl) ester
Nu-bait II

41 more names available

CAS RN 68694-11-1

CIS Sources of Information

32 - RTECS (Reg. of Toxic Effects of Chem. Substances): NI4490000
232 - DATALOG (Environmental Fate References)

PROCURE

1 Non-CIS References Available

C15H15ClF3N3O

Structure information not available for this compound.

4-Chloro-alpha,alpha,alpha-trifluoro-N-(1-imidazol-1-yl-2-propoxy ethylidene)-o-toluidine
(E)-4-Chloro-alpha,alpha,alpha-trifluoro-N-(1-imidazol-1-yl-2-pro poxyethylidene)-o-toluidine
1-(1-((4-Chloro-2-(trifluoromethyl)phenyl)imino)-2-propoxyethyl)- 1H-imidazole
1H-Imidazole, 1-(1-((4-chloro-2-(trifluoromethyl)phenyl)imino)-2- propoxyethyl)-
NF-114

5 more names available

Option? sshow 7

Entry: 1

CAS RN 63-25-2

CIS Sources of Information

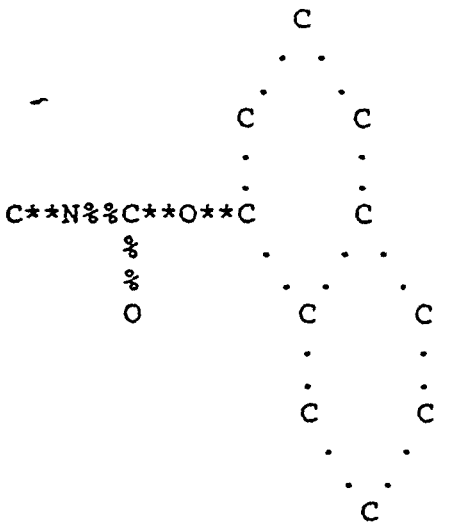
1 - TSCAINV (TSCA Inventory)
5 - OHM/TADS (Oil and Hazardous Materials): 7216550
7 - Merck Index: 1789
32 - RTECS (Reg. of Toxic Effects of Chem. Substances): FC5950000
37 - CHRIS (Chemical Hazards Response Info System): CBY
50 - CTCP, Product Formulation Information
51 - TSCAPP (TSCA Plant and Production)
56 - TSCATS (TSCA Test Submissions)
60 - WMSSS (Wiley Registry of Mass Spectral Data)
63 - CTCP, Toxicity Statement Information
120 - CCRIS (Carcinogenicity Studies)

213 - GIABS (Gastro-Intestinal Absorptivity)
214 - PHYTOTOX (Plant Toxicity)
215 - IFIS (EPA Industry Specific Regulations)
216 - CASR (EPA Chemical Activities)
217 - GENETOX (Genetic Assay Studies)
218 - ISHOW (Physical Properties)
219 - ENVIROFATE (Environmental Fate)
220 - AQUIRE (Aquatic Toxicity)
221 - DERMAL (Dermal Absorption)
225 - IRIS (Integrated Risk Information System)
227 - ERNS (Emergency Response Notification System)
231 - BIOLOG (Biodegradation Bibliographic References)
232 - DATALOG (Environmental Fate References)

44 Non-CIS References Available

SEVIN

C12H11NO2



1-Naphthalenol, methylcarbamate (9CI)
Carbamic acid, methyl-, 1-naphthyl ester (8CI)
Arilat
Arilate
Arylam

94 more names available

)ption? sshow 8

:ntry: 1

AS RN 12427-38-2

CIS Sources of Information

5 - OHM/TADS (Oil and Hazardous Materials): 8400296

Merck Index: 5598
32 - RTECS (Reg. of Toxic Effects of Chem. Substances): OP0700000
50 - CTCP, Product Formulation Information
56 - TSCATS (TSCA Test Submissions)
60 - WMSSS (Wiley Registry of Mass Spectral Data)
63 - CTCP, Toxicity Statement Information
120 - CCRIS (Carcinogenicity Studies)
213 - GIABS (Gastro-Intestinal Absorptivity)
215 - IFIS (EPA Industry Specific Regulations)
216 - CASR (EPA Chemical Activities)
217 - GENETOX (Genetic Assay Studies)
218 - ISHOW (Physical Properties)
219 - ENVIROFATE (Environmental Fate)
220 - AQUIRE (Aquatic Toxicity)
225 - IRIS (Integrated Risk Information System)
230 - BIODEG (Biodegradation of Substances)
231 - BIOLOG (Biodegradation Bibliographic References)
232 - DATALOG (Environmental Fate References)

MANEB

24 Non-CIS References Available

C4H6MnN2S4

=

Structure information not available for this compound.

Manganese, [[1,2-ethanediylbis[carbamodithioato]](2-)]- (9CI)
Manganese, [ethylenebis[dithiocarbamato]]- (VAN8CI)
Aamangan
Akzo Chemie Maneb
Amangan

94 more names available

Option? sshow 9

Entry: 1

CAS RN 8018-01-7

CIS Sources of Information

7 - Merck Index: 5598
32 - RTECS (Reg. of Toxic Effects of Chem. Substances): ZB3200000
50 - CTCP, Product Formulation Information
56 - TSCATS (TSCA Test Submissions)
63 - CTCP, Toxicity Statement Information
213 - GIABS (Gastro-Intestinal Absorptivity)
215 - IFIS (EPA Industry Specific Regulations)
216 - CASR (EPA Chemical Activities)

217 - GENETOX (Genetic Assay Studies)
218 - ISHOW (Physical Properties)
220 - AQUIRE (Aquatic Toxicity)
231 - BIOLOG (Biodegradation Bibliographic References)
232 - DATALOG (Environmental Fate References)

13 Non-CIS References Available

PENNCOZEB
PENNCOZEB

C4H6MnN2S4.C4H6N2S4Zn

Structure information not available for this compound.

Manganese, [[1,2-ethanediylbis[carbamodithioato]](2-)]-, mixt. wi
th [[1,2-ethanediylbis[carbamodithioato]](2-)]zinc (9CI)
Carbamic acid, ethylenebis[dithio-, manganese zinc complex (8CI)
Carmazine
Dithane M 45
Dithane S 60

32 more names available

Option? sshow 10

Entry: 1

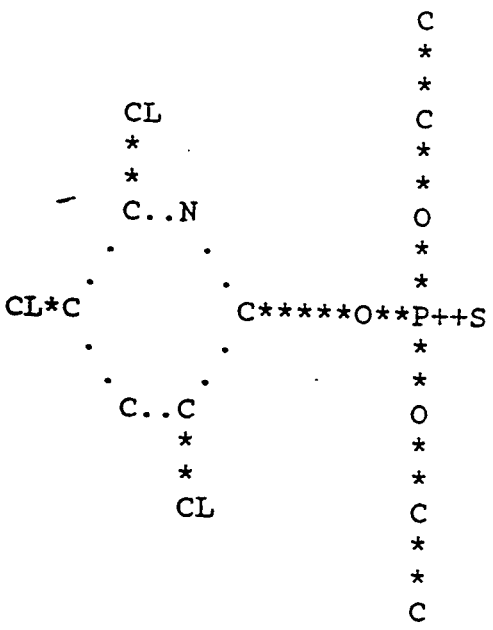
CAS RN 2921-88-2

CIS Sources of Information

5 - OHM/TADS (Oil and Hazardous Materials): 7800025
7 - Merck Index: 2190
32 - RTECS (Reg. of Toxic Effects of Chem. Substances): TF6300000
50 - CTCP, Product Formulation Information
56 - TSCATS (TSCA Test Submissions)
60 - WMSSS (Wiley Registry of Mass Spectral Data)
63 - CTCP, Toxicity Statement Information
213 - GIABS (Gastro-Intestinal Absorptivity)
214 - PHYTOTOX (Plant Toxicity)
215 - IFIS (EPA Industry Specific Regulations)
216 - CASR (EPA Chemical Activities)
217 - GENETOX (Genetic Assay Studies)
218 - ISHOW (Physical Properties)
219 - ENVIROFATE (Environmental Fate)
220 - AQUIRE (Aquatic Toxicity)
221 - DERMAL (Dermal Absorption)
225 - IRIS (Integrated Risk Information System)
227 - ERNS (Emergency Response Notification System)
231 - BIOLOG (Biodegradation Bibliographic References)
232 - DATALOG (Environmental Fate References)

30 Non-CIS References Available

C9H11Cl3NO3PS



LORSBAN
DURSBAN
CHLORPYRIFOS

Phosphorothioic acid, O,O-diethyl O-(3,5,6-trichloro-2-pyridinyl) ester (9CI)
Phosphorothioic acid, O,O-diethyl O-(3,5,6-trichloro-2-pyridyl) ester (8CI)
Brodan
Chloropyrifos
Chloropyriphos

37 more names available

Option?

ODOR THRESHOLD
Detection: 0.0002 mg/kg water [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983., p. 226] **QC REVIEWED**

SKIN, EYE AND RESPIRATORY IRRITATIONS
Irritating to eyes and skin. [Commission of the European Communities. Legislation on Dangerous Substances - Classification and Labelling in the European Communities. Vol. II. London and Trotman Ltd., 1989., p. 98] **QC REVIEWED**

COLOR/FORM — Colorless crystals [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987., p. 41] **QC REVIEWED**

COLOR/FORM — BROWN WAXY SOLID [Sax, N.I. and R.J. Lewis, Sr. (eds.). Hawley's Condensed Chemical Dictionary. 11th ed. New York: Van Nostrand Reinhold Co., 1987., p. 110] **QC REVIEWED**

COLOR/FORM — Colorless crystalls or a brown waxy solid. [NIOSH. NIOSH Pocket Guide to Chemical Hazards. DHHS (NIOSH) Publication No. 94-116. Washington, D.C.: U.S. Government Printing Office, June 1994., p. 22] **QC REVIEWED**

ODOR — NO DATA

NON-HUMAN TOXICITY VALUES
LD50 Guinea pig male oral 80 mg/kg [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983., p. 227] **QC REVIEWED**

NON-HUMAN TOXICITY VALUES
LD50 Rat oral 13-16.4 mg/kg [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983., p. 227] **QC REVIEWED**

NON-HUMAN TOXICITY VALUES
LD50 Rat dermal 220 mg/kg [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983., p. 227] **QC REVIEWED**

[HSDB] [illegible]
USER:
prt mf hazr wrnp odcofo odor ntxv ss 2 cont indented
1 - HSDB

NAME OF SUBSTANCE — FOSETYL-AL
CAS REGISTRY NUMBER — 39148-24-8
MOLECULAR FORMULA — C6-H18-Al-O9-P3 **PEER REVIEWED**

ALLIETTE

REACTIVITIES & INCOMPATIBILITIES
Incompatible with foliar fertilizers. [Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987. A013/AUG 87] **PEER REVIEWED**

DECOMPOSITION — NO DATA
POLYMERIZATION — NO DATA
OTHER HAZARDOUS REACTIONS — NO DATA
ODOR THRESHOLD — NO DATA
SKIN, EYE AND RESPIRATORY IRRITATIONS — NO DATA
COLOR/FORM — White crystals [Budavari, S. (ed.). The Merck Index - Encyclopedia of Chemicals, Drugs and Biologicals. Rahway, NJ: Merck

	and Co., Inc., 1989., p. 665] **PEER REVIEWED**
COLOR/FORM	Colorless crystals [Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987. A013/AUG 87] **PEER REVIEWED**
COLOR/FORM	Colorless powder [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987., p. 438] **PEER REVIEWED**
ODOR	Odorless [Budavari, S. (ed.). The Merck Index - Encyclopedia of Chemicals, Drugs and Biologicals. Rahway, NJ: Merck and Co., Inc., 1989., p. 665] **PEER REVIEWED**

NON-HUMAN TOXICITY VALUES

LD50 Rat oral 5800 mg/kg [Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987. A013/AUG 87] **PEER REVIEWED**

NON-HUMAN TOXICITY VALUES

LD50 Mouse oral 3700 mg/kg [Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987. A013/AUG 87] **PEER REVIEWED**

NON-HUMAN TOXICITY VALUES

LD50 Rat percutaneous >3200 mg/kg [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987., p. 438] **PEER REVIEWED**

[HSDB]SS8/cf?a
USER:
prt mf hazr wrnp cofo odor nttxv ss 3 cont indented
1 - HSDB

NAME OF SUBSTANCE	METHOMYL
CAS REGISTRY NUMBER	16752-77-5
MOLECULAR FORMULA	C5-H10-N2-O2-S **PEER REVIEWED**

REACTIVITIES & INCOMPATIBILITIES

Strong bases. [NIOSH. NIOSH Pocket Guide to Chemical Hazards. DHHS (NIOSH) Publication No. 94-116. Washington, D.C.: U.S. Government Printing Office, June 1994., p. 194] **QC REVIEWED**

DECOMPOSITION	NO DATA
POLYMERIZATION	NO DATA
OTHER HAZARDOUS REACTIONS	NO DATA
ODOR THRESHOLD	NO DATA
SKIN, EYE AND RESPIRATORY IRRITATIONS	NO DATA
COLOR/FORM	COLORLESS CRYSTALLINE SOLID [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987., p. 550] **PEER REVIEWED**
COLOR/FORM	WHITE CRYSTALLINE SOLID [Farm Chemicals Handbook 1989. Willoughby, OH: Meister Publishing Co., 1989. C-191] **PEER REVIEWED**

METLANATE

COLOR/FORM White, crystalline solid. [NIOSH. NIOSH Pocket Guide to Chemical Hazards. DHHS (NIOSH) Publication No. 94-116. Washington, D.C.: U.S. Government Printing Office, June 1994., p. 194] **QC REVIEWED**

ODOR SLIGHTLY SULFUROUS [Farm Chemicals Handbook 1989. Willoughby, OH: Meister Publishing Co., 1989. C-191] **PEER REVIEWED**

ODOR Slight, sulfur-like odor. [NIOSH. NIOSH Pocket Guide to Chemical Hazards. DHHS (NIOSH) Publication No. 94-116. Washington, D.C.: U.S. Government Printing Office, June 1994., p. 194] **QC REVIEWED**

NON-HUMAN TOXICITY VALUES

LD50 Rat oral 31 mg active ingredient (as 240 g/l liquid)/kg [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987., p. 550] **PEER REVIEWED**

NON-HUMAN TOXICITY VALUES

LD50 Rat oral 47 mg active ingredient (as wettable powder)/kg [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987., p. 550] **PEER REVIEWED**

NON-HUMAN TOXICITY VALUES

LD50 Rabbit percutaneous 4080 mg ai (as 240 g/l liq)/kg [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987., p. 550] **PEER REVIEWED**

NON-HUMAN TOXICITY VALUES

LD50 Rat (male) oral 17 mg active ingredient [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987., p. 550] **PEER REVIEWED**

=[HSDB]=SS=8=/cf?

USER:

prt mf hazr wrnp cofo odor ntxv ss 3 cont indented

1 - HSDB

NAME OF SUBSTANCE METHOMYL

CAS REGISTRY NUMBER 16752-77-5

MOLECULAR FORMULA C5-H10-N2-O2-S **PEER REVIEWED**

REACTIVITIES & INCOMPATIBILITIES

Strong bases. [NIOSH. NIOSH Pocket Guide to Chemical Hazards. DHHS (NIOSH) Publication No. 94-116. Washington, D.C.: U.S. Government Printing Office, June 1994., p. 194] **QC REVIEWED**

DECOMPOSITION NO DATA

POLYMERIZATION NO DATA

OTHER HAZARDOUS REACTIONS NO DATA

ODOR THRESHOLD NO DATA

SKIN, EYE AND RESPIRATORY IRRITATIONS NO DATA

COLOR/FORM COLORLESS CRYSTALLINE SOLID [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987., p. 550] **PEER REVIEWED**

COLOR/FORM WHITE CRYSTALLINE SOLID [Farm Chemicals Handbook 1989. Willoughby, OH: Meister Publishing Co., 1989. C-191] **PEER REVIEWED**

COLOR/FORM White, crystalline solid. [NIOSH. NIOSH Pocket Guide to Chemical Hazards. DHHS (NIOSH) Publication No. 94-116. Washington, D.C.: U.S. Government Printing Office, June 1994., p. 194] **QC REVIEWED**

ODOR SLIGHTLY SULFUROUS [Farm Chemicals Handbook 1989. Willoughby, OH: Meister Publishing Co., 1989. C-191] **PEER REVIEWED**

ODOR Slight, sulfur-like odor. [NIOSH. NIOSH Pocket Guide to Chemical Hazards. DHHS (NIOSH) Publication No. 94-116. Washington, D.C.: U.S. Government Printing Office, June 1994., p. 194] **QC REVIEWED**

NON-HUMAN TOXICITY VALUES

LD50 Rat oral 31 mg active ingredient (as 240 g/l liquid)/kg [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987., p. 550] **PEER REVIEWED**

NON-HUMAN TOXICITY VALUES

LD50 Rat oral 47 mg active ingredient (as wettable powder)/kg [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987., p. 550] **PEER REVIEWED**

NON-HUMAN TOXICITY VALUES

LD50 Rabbit percutaneous 4080 mg ai (as 240 g/l liq)/kg [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987., p. 550] **PEER REVIEWED**

NON-HUMAN TOXICITY VALUES

LD50 Rat (male) oral 17 mg active ingredient [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987., p. 550] **PEER REVIEWED**

[HSDB] SS 8 /cf?

USER:
prt mf hazr wrnp cofo odor ntxv ss 4. cont indented
1 - HSDB
NAME OF SUBSTANCE CARBARYL
CAS REGISTRY NUMBER 63-25-2
MOLECULAR FORMULA C12-H11-N-O2 **QC REVIEWED**

REACTIVITIES & INCOMPATIBILITIES

Incompatible with strongly alkaline pesticides. [Worthing, C.R., S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 7th ed. Lavenham, Suffolk, Great Britain: The Lavenham Press Limited, 1983., p. 88] **QC REVIEWED**

REACTIVITIES & INCOMPATIBILITIES

Strong oxidizers, strongly alkaline pesticides. [NIOSH. NIOSH Pocket Guide to Chemical Hazards. DHHS (NIOSH) Publication No. 94-116. Washington, D.C.: U.S. Government Printing Office, June 1994., p. 50] **QC REVIEWED**

DECOMPOSITION

When heated to decomposition it emits toxic fumes of /nitrogen

SEVIN

oxides/. [Sax, N.I. Dangerous Properties of Industrial Materials. 6th ed. New York, NY: Van Nostrand Reinhold, 1984., p. 1823] **QC REVIEWED**

POLYMERIZATION	NO DATA
OTHER HAZARDOUS REACTIONS	NO DATA
ODOR THRESHOLD	NO DATA

SKIN, EYE AND RESPIRATORY IRRITATIONS

Irritating to skin & eyes. [U.S. Coast Guard, Department of Transportation. CHRIS - Hazardous Chemical Data. Volume II. Washington, D.C.: U.S. Government Printing Office, 1984-5.] **QC REVIEWED**

COLOR/FORM	WHITE OR GRAY SOLID [American Conference of Governmental Industrial Hygienists, Inc. Documentation of the Threshold Limit Values, 4th ed., 1980. Cincinnati, Ohio: American Conference of, p. 67] Governmmental Industrial Hygienists, Inc., 1980., p. 67] **QC REVIEWED**
COLOR/FORM	Colorless solid [Mackison, F.W., R.S. Stricoff, L.J. Partridge, Jr. (eds.). NIOSH/OSHA Pocket Guide to Chemical Hazards. DHEW (NIOSH). Publication No. 78-210. Washington, DC: U.S. Government Printing Office, 1980., p. 160] **QC REVIEWED**
COLOR/FORM	White or gray solid [pesticide]. [NIOSH. NIOSH Pocket Guide to Chemical Hazards. DHHS (NIOSH) Publication No. 94-116. Washington, D.C.: U.S. Government Printing Office, June 1994., p. 50] **QC REVIEWED**
ODOR	Essentially odorless. [Mackison, F. W., R. S. Stricoff, and L. J. Partridge, Jr. (eds.). NIOSH/OSHA - Occupational Health Guidelines for Chemical Hazards. DHHS(NIOSH) Publication, p. 2] No. 81-123 (3 VOLS). Washington, DC: U.S. Government Printing Office, Jan. 1981., p. 2] **QC REVIEWED**
ODOR	Odorless [pesticide]. [NIOSH. NIOSH Pocket Guide to Chemical Hazards. DHHS (NIOSH) Publication No. 94-116. Washington, D.C.: U.S. Government Printing Office, June 1994., p. 50] **QC REVIEWED**
NON-HUMAN TOXICITY VALUES	NO DATA

[HSDB]SS 8 /cf2
USER:
prt mf hazr wrnp cofo odor ntxv ss 5 cont indented
1 - HSDB

NAME OF SUBSTANCE	MANEB
CAS REGISTRY NUMBER	12427-38-2
MOLECULAR FORMULA	C4-H6-MN-N2-S4 **PEER REVIEWED**
REACTIVITIES & INCOMPATIBILITIES	NO DATA
DECOMPOSITION	NO DATA
POLYMERIZATION	NO DATA

OTHER HAZARDOUS REACTIONS

Spontaneously combustible [Sittig, M. Handbook of Toxic and Hazardous Chemicals and Carcinogens, 1985. 2nd ed. Park Ridge, NJ: Noyes Data Corporation, 1985., p. 558] **PEER REVIEWED**

ODOR THRESHOLD NO DATA

SKIN, EYE AND RESPIRATORY IRRITATIONS

May cause irritation to skin, eyes, nose, & throat. [Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987. A252/AUG 87] **PEER REVIEWED**

COLOR/FORM YELLOW POWDER; CRYSTALS FROM ALCOHOL [Budavari, S. (ed.). The Merck Index - Encyclopedia of Chemicals, Drugs and Biologicals. Rahway, NJ: Merck and Co., Inc., 1989., p. 899] **PEER REVIEWED**

COLOR/FORM brown powder [Sax, N.I. and R.J. Lewis, Sr. (eds.). Hawley's Condensed Chemical Dictionary. 11th ed. New York: Van Nostrand Reinhold Co., 1987., p. 727] **PEER REVIEWED**

ODOR Faint [Purdue University; National Pesticide Information Retrieval System, Maneb Fact Sheet No. 182 (1988)] **PEER REVIEWED**

NON-HUMAN TOXICITY VALUES

LD50 Rat oral 6750 mg/kg [Kirk-Othmer Encyclopedia of Chemical Technology. 3rd ed., Volumes 1-26. New York, NY: John Wiley and Sons, 1978-1984. V14 885 (1981)] **PEER REVIEWED**

NON-HUMAN TOXICITY VALUES

LD50 Rat percutaneous > 5000 mg/kg [Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987. A252/AUG 87] **PEER REVIEWED**

NON-HUMAN TOXICITY VALUES

LD50 Rabbit dermal > 2 g/kg [Purdue University; National Pesticide Information Retrieval System, Maneb Fact Sheet No. 182 (1988)] **PEER REVIEWED**

NON-HUMAN TOXICITY VALUES

LD50 Rat oral 4400 mg/kg [Purdue University; National Pesticide Information Retrieval System, Maneb Fact Sheet No. 182 (1988)] **PEER REVIEWED**

[HSDB] SS 8 /cf?

USER:

prt mf hazr mwrnp cofo odor hntxv ss 6 cont indented

1 - HSDB

NAME OF SUBSTANCE MANCOZEB

CAS REGISTRY NUMBER 8018-01-7

MOLECULAR FORMULA NO DATA

REACTIVITIES & INCOMPATIBILITIES NO DATA

DECOMPOSITION

Slowly decomposed by heat and moisture. [Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987. A251/Aug 87] **PEER REVIEWED**

POLYMERIZATION NO DATA

OTHER HAZARDOUS REACTIONS NO DATA

ODOR THRESHOLD NO DATA

SKIN, EYE AND RESPIRATORY IRRITATIONS

May cause skin irritation on repeated exposure. [Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987. A251/Aug 87] **PEER REVIEWED**

PENNCO 2 EB

COLOR/FORM Greyish-yellow powder [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987., p. 510] **PEER REVIEWED**

ODOR NO DATA

NON-HUMAN TOXICITY VALUES
LD50 Rat percutaneous > 10,000 mg/kg [Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987. A251/Aug 87] **PEER REVIEWED**

NON-HUMAN TOXICITY VALUES
LD50 Rat oral 8000 mg/kg [Sittig, M. (ed.) Pesticide Manufacturing and Toxic Materials Control Encyclopedia. park Ridge, NJ: Noyes Data Corporation. 1980., p. 483] **PEER REVIEWED**

[HSDB] SS 8 /cf2
USER:
rt mf hazr wrnp cofo odor ntxv ss 7 cont indented
- HSDB

NAME OF SUBSTANCE CHLORPYRIFOS
CAS REGISTRY NUMBER 2921-88-2
MOLECULAR FORMULA C9-H11-Cl3-N-O3-P-S **PEER REVIEWED**

REACTIVITIES & INCOMPATIBILITIES
Strong acids, caustics, amines [Note: Corrosive to copper & brass]. [NIOSH. NIOSH Pocket Guide to Chemical Hazards. DHHS (NIOSH) Publication No. 94-116. Washington, D.C.: U.S. Government Printing Office, June 1994., p. 70] **QC REVIEWED**

DECOMPOSITION
Decomposition temperature: approx 160 deg C [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983., p. 391] **PEER REVIEWED**

POLYMERIZATION NO DATA
OTHER HAZARDOUS REACTIONS NO DATA
ODOR THRESHOLD NO DATA

SKIN, EYE AND RESPIRATORY IRRITATIONS
May be irritating to skin and eyes. [Nat'l Research Council Canada; Ecotoxicology of Chlorpyrifos p.210 (1978) NRCC No. 10679] **PEER REVIEWED**

COLOR/FORM WHITE GRANULAR CRYSTALS [The Merck Index. 10th ed. Rahway, New Jersey: Merck Co., Inc., 1983., p. 309] **PEER REVIEWED**

COLOR/FORM Colorless crystals [Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987. A088/Aug 87] **PEER REVIEWED**

COLOR/FORM Colorless to white crystalline solid [Note: Commercial formulations may be combined with combustible liquids.] [NIOSH. NIOSH Pocket Guide to Chemical Hazards. DHHS (NIOSH) Publication No. 94-116. Washington, D.C.: U.S. Government Printing Office, June 1994., p. 70] **QC REVIEWED**

ODOR MILD MERCAPTAN ODOR [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton

LORSBAN

NAME OF SUBSTANCE SODIUM HYPOCHLORITE
CAS REGISTRY NUMBER 7681-52-9
MOLECULAR FORMULA Cl-H-O.Na **PEER REVIEWED**

REACTIVITIES & INCOMPATIBILITIES
Chlorination of ethyleneimine with sodium hypochlorite gives the explosive compound 1-chloroethyleneimine. [National Fire Protection Association. Fire Protection Guide on Hazardous Materials. 9th ed. Boston, MA: National Fire Protection Association, 1986. 491M-89] **PEER REVIEWED**

REACTIVITIES & INCOMPATIBILITIES
Primary amines and calcium hypochlorite or sodium hypochlorite react to form normal chloroamines, which are explosive. [National Fire Protection Association. Fire Protection Guide on Hazardous Materials. 9th ed. Boston, MA: National Fire Protection Association, 1986. 491M-44] **PEER REVIEWED**

REACTIVITIES & INCOMPATIBILITIES
Hypochlorites react with urea to form nitrogen trichloride which explodes spontaneously in air. /Hypochlorites/ [National Fire Protection Association. Fire Protection Guide on Hazardous Materials. 9th ed. Boston, MA: National Fire Protection Association, 1986. 491M-109] **PEER REVIEWED**

REACTIVITIES & INCOMPATIBILITIES
Contact in the drains of an effluent containing the hypochlorite with one containing ammonium salts and acid led to formation of nitrogen trichloride which decomp explosively. ... Cleaning a brewery tank with an acidified ammonium sulfate cleaning preparation, then sodium hypochlorite soln without intermediate rinsing, led to nitrogen trichloride formation and a violent explosion. [Bretherick, L. Handbook of Reactive Chemical Hazards. 3rd ed. Boston, MA: Butterworths, 1985., p. 939] **PEER REVIEWED**

REACTIVITIES & INCOMPATIBILITIES
Interaction of ethyleneimine with sodium (or other) hypochlorite gives the explosive N-chloro cmpd. [Bretherick, L. Handbook of Reactive Chemical Hazards. 3rd ed. Boston, MA: Butterworths, 1985., p. 939] **PEER REVIEWED**

REACTIVITIES & INCOMPATIBILITIES
Removal of formic acid from industrial waste streams with sodium hypochlorite soln becomes explosive at 55 deg C. [Bretherick, L. Handbook of Reactive Chemical Hazards. 3rd ed. Boston, MA: Butterworths, 1985., p. 939] **PEER REVIEWED**

REACTIVITIES & INCOMPATIBILITIES
Several explosions involving methanol and sodium hypochlorite were attributed to formation of methyl hypochlorite, especially in presence of acids or other esterification catalyst. [Bretherick, L. Handbook of Reactive Chemical Hazards. 3rd ed. Boston, MA: Butterworths, 1985., p. 939] **PEER REVIEWED**

REACTIVITIES & INCOMPATIBILITIES
Use of sodium hypochlorite soln to destroy acidified benzyl cyanide residues caused a violent explosion, thought to have been due to formation of nitrogen trichloride. [Bretherick, L. Handbook of Reactive Chemical Hazards. 3rd ed. Boston, MA: Butterworths, 1985., p. 939] **PEER REVIEWED**

DECOMPOSITION
The anhydrous solid obtained by dessication of the /sodium hypochlorite/ pentahydrate will decomp violently on heating or friction. [Bretherick, L. Handbook of Reactive Chemical Hazards. 3rd ed. Boston, MA: Butterworths, 1985., p. 939]

Heath, UK: The British Crop Protection Council, 1987., p. 179] **PEER REVIEWED**

ODOR Mild, mercaptan-like odor. [NIOSH. NIOSH Pocket Guide to Chemical Hazards. DHHS (NIOSH) Publication No. 94-116. Washington, D.C.: U.S. Government Printing Office, June 1994., p. 70] **QC REVIEWED**

NON-HUMAN TOXICITY VALUES

LD50 ALBINO RATS MALES ORAL 151 MG/KG, (95% CONFIDENCE LIMIT 179-252 MG/KG) /PURITY 99%/ [U.S. Department of the Interior, Fish and Wildlife Service. Handbook of Toxicity of Pesticides to Wildlife. Resource Publication 153. Washington, DC: U.S. Government Printing Office, 1984., p. 23] **PEER REVIEWED**

NON-HUMAN TOXICITY VALUES

LD50 ROCK DOVES (DOMESTIC PIGEONS) ORAL 26.9 MG/KG (95% CONFIDENCE LIMIT 19.0-38 MG/KG) /PURITY 94.5%/ [U.S. Department of the Interior, Fish and Wildlife Service. Handbook of Toxicity of Pesticides to Wildlife. Resource Publication 153. Washington, DC: U.S. Government Printing Office, 1984., p. 23] **PEER REVIEWED**

NON-HUMAN TOXICITY VALUES

LD50 DOMESTIC GOATS FEMALES ORAL 500-1000 MG/KG /PURITY 94.5%/ [U.S. Department of the Interior, Fish and Wildlife Service. Handbook of Toxicity of Pesticides to Wildlife. Resource Publication 153. Washington, DC: U.S. Government Printing Office, 1984., p. 23] **PEER REVIEWED**

[HSDB] SS 8 /cf?
USER:

PEER REVIEWED

DECOMPOSITION
May decomp, generating irritating chlorine gas. /Monohydrate/ [U.S. Coast Guard, Department of Transportation. CHRIS - Hazardous Chemical Data. Volume II. Washington, D.C.: U.S. Government Printing Office, 1984-5.] **PEER REVIEWED**

DECOMPOSITION
Decomposed by hot water [Sax, N.I. and R.J. Lewis, Sr. (eds.). Hawley's Condensed Chemical Dictionary. 11th ed. New York: Van Nostrand Reinhold Co., 1987., p. 1063] **PEER REVIEWED**

POLYMERIZATION NO DATA
OTHER HAZARDOUS REACTIONS NO DATA
ODOR THRESHOLD NO DATA

SKIN, EYE AND RESPIRATORY IRRITATIONS
It has a pronounced irritant effect on the skin. [International Labour Office. Encyclopedia of Occupational Health and Safety. Vols. I&II. Geneva, Switzerland: International Labour Office, 1983., p. 299] **PEER REVIEWED**

SKIN, EYE AND RESPIRATORY IRRITATIONS
Irritating to skin and eyes. /Monohydrate/ [U.S. Coast Guard, Department of Transportation. CHRIS - Hazardous Chemical Data. Volume II. Washington, D.C.: U.S. Government Printing Office, 1984-5.] **PEER REVIEWED**

COLOR/FORM In solution only [Weast, R.C. (ed.) Handbook of Chemistry and Physics. 69th ed. Boca Raton, FL: CRC Press Inc., 1988-1989. B-130] **PEER REVIEWED**

COLOR/FORM Greenish yellow liquid [Environment Canada; Tech Info for Problem Spills: Sodium Hypochlorite (Draft) p.3 (1985)] **PEER REVIEWED**

ODOR Disagreeable, sweetish odor [Sax, N.I. and R.J. Lewis, Sr. (eds.). Hawley's Condensed Chemical Dictionary. 11th ed. New York: Van Nostrand Reinhold Co., 1987., p. 1063] **PEER REVIEWED**

NON-HUMAN TOXICITY VALUES
LD50 Rat oral 8.91 g/kg [U.S. Coast Guard, Department of Transportation. CHRIS - Hazardous Chemical Data. Volume II. Washington, D.C.: U.S. Government Printing Office, 1984-5.] **PEER REVIEWED**

[HSDB] SS 4 /cf?
USER:
prt mf hazr wrnp corfo odor ntxv ss 2 cont indented
1 - HSDB
NAME OF SUBSTANCE [redacted]
CAS REGISTRY NUMBER 1563-66-2
MOLECULAR FORMULA C12-H15-N-O3 **PEER REVIEWED**

REACTIVITIES & INCOMPATIBILITIES
Alkaline substances, acid, strong oxidizers (e.g., perchlorates, peroxides, chlorates, nitrates, permanganates). [NIOSH. NIOSH Pocket Guide to Chemical Hazards. DHHS (NIOSH) Publication No. 94-116. Washington, D.C.: U.S. Government Printing Office, June 1994., p. 52] **PEER REVIEWED**

DECOMPOSITION NO DATA
POLYMERIZATION NO DATA
OTHER HAZARDOUS REACTIONS NO DATA
ODOR THRESHOLD NO DATA
SKIN, EYE AND RESPIRATORY NO DATA

COLOR/FORM	WHITE, CRYSTALLINE SOLID [Budavari, (ed.). The Merck Index - Encyclopedia of Chemicals, Drugs and Biologicals. Rahway, NJ: Merck and Co., Inc., 1989., p. 273] **PEER REVIEWED**
COLOR/FORM	White or grayish, crystalline solid [Note: May be dissolved in a liquid carrier]. [NIOSH. NIOSH Pocket Guide to Chemical Hazards. DHHS (NIOSH) Publication No. 94-116. Washington, D.C.: U.S. Government Printing Office, June 1994., p. 52] **PEER REVIEWED**
ODOR	ODORLESS (PURE MATERIAL) [Farm Chemicals Handbook 1994. Willoughby, OH: Meister, 1994. C-70] **PEER REVIEWED**
ODOR	Slightly phenolic. [USEPA/ODW; Health Advisory for Carbofuran (Draft) p.2 (1985)] **PEER REVIEWED**

NON-HUMAN TOXICITY VALUES

LD50 Rabbit percutaneous 10,200 mg/kg [Farm Chemicals Handbook 1989. Willoughby, OH: Meister Publishing Co., 1989. C-60] **PEER REVIEWED**

NON-HUMAN TOXICITY VALUES

LD50 Rabbit percutaneous 2550 mg/kg /Active ingredient as wettable powder/ [Worthing, C.R. and S.B. Walker (eds.). The Pesticide Manual - A World Compendium. 8th ed. Thornton Heath, UK: The British Crop Protection Council, 1987., p. 130] **PEER REVIEWED**

NON-HUMAN TOXICITY VALUES

LD50 Rabbit percutaneous 885 mg/kg /Technical grade/ [Spencer, E. Y. Guide to the Chemicals Used in Crop Protection. 7th ed. Publication 1093. Research Institute, Agriculture Canada, Ottawa, Canada: Information Canada, 1982., p. 86] **PEER REVIEWED**

NON-HUMAN TOXICITY VALUES

LD50 Mouse oral 2 mg/kg [The Merck Index. 10th ed. Rahway, New Jersey: Merck Co., Inc., 1983., p. 250] **PEER REVIEWED**

NON-HUMAN TOXICITY VALUES

LD50 Chicken 25-39 mg/kg (powder) [Farm Chemicals Handbook 1989. Willoughby, OH: Meister Publishing Co., 1989. C-60] **PEER REVIEWED**

NON-HUMAN TOXICITY VALUES

LD50 Guinea pig oral 9.18 mg/kg [Spencer, E. Y. Guide to the Chemicals Used in Crop Protection. 7th ed. Publication 1093. Research Institute, Agriculture Canada, Ottawa, Canada: Information Canada, 1982., p. 86] **PEER REVIEWED**

NON-HUMAN TOXICITY VALUES

LD50 Dog oral approximately 15.0 mg/kg [Spencer, E. Y. Guide to the Chemicals Used in Crop Protection. 7th ed. Publication 1093. Research Institute, Agriculture Canada, Ottawa, Canada: Information Canada, 1982., p. 86] **PEER REVIEWED**

NON-HUMAN TOXICITY VALUES

LD50 Dog oral 19 mg/kg (as powder) [Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987. A060] **PEER REVIEWED**

NON-HUMAN TOXICITY VALUES

LD50 Rat oral 11 mg/kg [Farm Chemicals Handbook 1989. Willoughby, OH: Meister Publishing Co., 1989. C-60] **PEER

REVIEWED**

NON-HUMAN TOXICITY VALUES

LD50 Rat oral 8.2 to 14.1 mg/kg (in corn oil) [Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987. A060] **PEER REVIEWED**

NON-HUMAN TOXICITY VALUES

LD50 Rat oral 10 mg/kg /Technical grade/ [Spencer, E. Y. Guide to the Chemicals Used in Crop Protection. 7th ed. Publication 1093. Research Institute, Agriculture Canada, Ottawa, Canada: Information Canada, 1982., p. 86] **PEER REVIEWED**

NON-HUMAN TOXICITY VALUES

LD50 Rat (male) oral 8.7 mg/kg [American Conference of Governmental Industrial Hygienists, Inc. Documentation of the Threshold Limit Values and Biological Exposure Indices. 6th ed. Volumes I,, p. 218] II, III. Cincinnati, OH: ACGIH, 1991., p. 218] **PEER REVIEWED**

NON-HUMAN TOXICITY VALUES

LD50 Rat (female) oral 8.0 mg/kg [American Conference of Governmental Industrial Hygienists, Inc. Documentation of the Threshold Limit Values and Biological Exposure Indices. 6th ed. Volumes I,, p. 218] II, III. Cincinnati, OH: ACGIH, 1991., p. 218] **PEER REVIEWED**

NON-HUMAN TOXICITY VALUES

LD50 Rat percutaneous 1350 mg/kg /Flowable powder, 4 lb active ingredient/gal/ [American Conference of Governmental Industrial Hygienists. Documentation of the Threshold Limit Values and Biological Exposure Indices. 5th ed. Cincinnati, OH:, p. 100] American Conference of Governmental Industrial Hygienists, 1986., p. 100] **PEER REVIEWED**

NON-HUMAN TOXICITY VALUES

MLD Rat oral 23.4 mg/kg /Flowable powder, 4 lb active ingredient/gal/ [American Conference of Governmental Industrial Hygienists. Documentation of the Threshold Limit Values and Biological Exposure Indices. 5th ed. Cincinnati, OH:, p. 100] American Conference of Governmental Industrial Hygienists, 1986., p. 100] **PEER REVIEWED**

NON-HUMAN TOXICITY VALUES

LD50 Rat ocular 21.5 mg/kg /25% Wettable powder/ [American Conference of Governmental Industrial Hygienists. Documentation of the Threshold Limit Values and Biological Exposure Indices. 5th ed. Cincinnati, OH:, p. 100] American Conference of Governmental Industrial Hygienists, 1986., p. 100] **PEER REVIEWED**

NON-HUMAN TOXICITY VALUES

LD50 Rat ocular 18.0 mg/kg /75% Wettable powder/ [American Conference of Governmental Industrial Hygienists. Documentation of the Threshold Limit Values and Biological Exposure Indices. 5th ed. Cincinnati, OH:, p. 100] American Conference of Governmental Industrial Hygienists, 1986., p. 100] **PEER REVIEWED**

NON-HUMAN TOXICITY VALUES

LD50 Rat oral 5 mg/kg [Matsumura, F. Toxicology of Insecticides. 2nd ed. New York, NY: Plenum Press, 1985., p. 84] **PEER REVIEWED**

[HSDB] SS 4 /cf?
USER:
prt mf hazr wrnp cofo odor ntxv ss 3 cont indented
1 - HSDB

NAME OF SUBSTANCE WARFARIN
CAS REGISTRY NUMBER 81-81-2
MOLECULAR FORMULA C19-H16-O4 **PEER REVIEWED**
REACTIVITIES & INCOMPATIBILITIES
Strong oxidizers. [NIOSH. NIOSH Pocket Guide to Chemical Hazards. DHHS (NIOSH) Publication No. 94-116. Washington, D.C.: U.S. Government Printing Office, June 1994., p. 334] **QC REVIEWED**
DECOMPOSITION NO DATA
POLYMERIZATION NO DATA
OTHER HAZARDOUS REACTIONS NO DATA
ODOR THRESHOLD NO DATA
SKIN, EYE AND RESPIRATORY IRRITATIONS NO DATA
COLOR/FORM CRYSTALS FROM ALCOHOL [Budavari, S. (ed.). The Merck Index - Encyclopedia of Chemicals, Drugs and Biologicals. Rahway, NJ: Merck and Co., Inc., 1989., p. 1583] **PEER REVIEWED**
COLOR/FORM White powder [Farm Chemicals Handbook 1994. Willoughby, OH: Meister, 1994. C-381] **PEER REVIEWED**
COLOR/FORM Colorless, crystalline powder. [NIOSH. NIOSH Pocket Guide to Chemical Hazards. DHHS (NIOSH) Publication No. 94-116. Washington, D.C.: U.S. Government Printing Office, June 1994., p. 334] **QC REVIEWED**
ODOR Odorless [Sax, N.I. Dangerous Properties of Industrial Materials. 6th ed. New York, NY: Van Nostrand Reinhold, 1984., p. 811] **PEER REVIEWED**
ODOR Odorless. [NIOSH. NIOSH Pocket Guide to Chemical Hazards. DHHS (NIOSH) Publication No. 94-116. Washington, D.C.: U.S. Government Printing Office, June 1994., p. 334] **QC REVIEWED**
NON-HUMAN TOXICITY VALUES
LD50 rat (female) oral 9 mg/kg, single dose /Warfarin sodium/ [Gosselin, R.E., R.P. Smith, H.C. Hodge. Clinical Toxicology of Commercial Products. 5th ed. Baltimore: Williams and Wilkins, 1984. III-395] **PEER REVIEWED**
NON-HUMAN TOXICITY VALUES
LD50 Sprague-Dawley rat (male) oral 100 mg/kg /Warfarin sodium/ [Gosselin, R.E., R.P. Smith, H.C. Hodge. Clinical Toxicology of Commercial Products. 5th ed. Baltimore: Williams and Wilkins, 1984. III-395] **PEER REVIEWED**
NON-HUMAN TOXICITY VALUES
LD50 Rat dermal 1400 mg/kg [American Conference of Governmental Industrial Hygienists, Inc. Documentation of the Threshold Limit Values and Biological Exposure Indices. 6th ed. Volumes I,, p. 1723] II, III. Cincinnati, OH: ACGIH, 1991., p. 1723] **PEER REVIEWED**

[HSDB] SS 4 /cf?
USER:
prt mf ss 2 cont indented
1 - HSDB
NAME OF SUBSTANCE CARBOFURAN
CAS REGISTRY NUMBER 1563-66-2

Appendix C

SUBJECT: Situation Report (SITREP): One, BPS Chemical Warehouse Fire, Helena, AR

FROM: Emergency Response Coordinator, Emergency Response and Scientific Assessment Branch, Division of Toxicology, ATSDR (E57)

TO: Jim Holler
Chief, Emergency Response
and Scientific Assessment Branch

THRU: Chief, Emergency Response Section

This situation report reflects the activities of ATSDR personnel on the scene of an pollution incident. Statements of fact, other than those reflective of Agency action, and information reported in this report may not be accurate due to the changing situation at any incident of this type. Conflicts between the descriptions, other than those of Agency action, given here and the Pollution Report (POLREP) submitted by the On-Scene Coordinator or similar reports by other agencies should be resolved in favor of the POLREP. All information released to the public during the incident must be cleared through the On-Scene Coordinator, in accordance with 40 CFR 300.155(b).

I. SITUATION

On May 8, 1997 at approximately 1:00 pm Central Time, a fire broke out in a container of methyl azinphos (guthion) at a chemical repackaging facility in Helena, AR. Helena is a small to mid-size community approximately 80 miles south of Memphis, TN on the banks of the Mississippi River. Local firefighters responded to the scene and extinguished the blaze, but a reflash occurred at about 3:00 pm. As the initial entry team from the Helena Fire Dept. approached the building, an explosion occurred collapsing a cinder block wall on the entry team. Subsequent reports indicated that three firefighters in the entry team were killed and a fourth is missing. An estimated 23 additional persons were injured during this initial phase of the incident. A three mile area was evacuated, including a 75 bed hospital with approximately 44 patients. 12 of the patients were in acute care.

EPA Region VI received notification from the National Response Center within about 40 minutes before ATSDR did at 4:00 pm. Beginning at 6:45 that evening, ATSDR began receiving calls from the evacuated area. The Arkansas State Epidemiologist requested on-site assistance from ATSDR at approximately 10:00 pm, 5/8/97. An ATSDR response team consisting of Emergency Response Coordinators S. Wright and R. Zabrocki arrived on scene at the Phillip County Emergency Operations Center at approximately 9:00 am, 5/9/97.

II. CONTACTS MADE

Jim Mullins, Chief, Emergency Response, EPA Region VI
Mike Ryan, EPA Region VI On-Scene Coordinator (FOSC)
Dr. Tom McChesney, Arkansas Dept. Of Public Health, State Epidemiologist
Bill Tear, ArDPH Sanitarian Supervisor
Kay Dobbins, ArDPH Associate Director, Environmental Science
Mike Forman, ArDPH Laboratory Director
Larry Thompson, Bayer Chemical, TransCAER Responder
Bill Hubbes, Emergency Response, Rhone-Poulenc Chemical
Joe Deptman, Chemical Manufacturer's Ass'n., Chemical Emergency Center (CHEMTREC)
Fred Fowler, ArDPH on scene.
Tim Davy, Kroger Supermarkets

III. ACTIONS TAKEN

At 4:10 pm, 5/8/97, ATSDR Emergency Response contacted ATSDR Region VI and faxed a copy of the NRC report to the region.

At 6:30 pm, ATSDR responded to a call from the Kroger Grocery store in West Helena, AR. The Kroger representative indicated that he had been ordered to shut off his air conditioning unit, because of the fire at the BPS plant 12 miles away. The store was shut down and evacuated by local authorities. Kroger knew that the chemical involved in the fire was methyl azinphos (aka, guthion). They called to find out what effect the smoke and chemicals would have on their food products. ATSDR indicated that, 12 miles away from the source and inside the store, the probability was that the food would be unaffected; however, it would be prudent for the store to contact the regional office of the Food and Drug Administration to verify that conclusion.

Due to this second call on the same incident, ATSDR contacted EPA Region VI in Dallas, TX. They indicated that five state agencies were either enroute or on scene. EPA had an On-Scene Coordinator enroute as well. The Pine Bluff Arsenal in nearby Pine Bluff, AR was sending an response with air monitoring equipment and an gas chromatograph. An Industrial Hygienist and CAER Emergency Responder from Bayer Chemical, Kansas City {a former production site for the product} was enroute to the scene as well. (CAER is a community outreach and mutual aid program of the Chemical Manufacturer's Association [CMA].) EPA believes that 4 firemen had died in the explosion, but they were not certain if it was trauma or chemical exposure that killed them. The three chemicals believed to be involved are methyl azinophos (1-2 cubic yards), methomyl, and thiophanate; all pesticides. The azinophos (guthion) was shipped to the facility from Israel.

ATSDR contacted the CMA responder through their Emergency Communications Center, CHEMTREC. CHEMTREC was able to reach the responder in the Kansas City Airport, where ATSDR learned that the West Helena Regional Medical Center had been evacuated and many residents were sheltering in their homes using a shelter-in-place technique.

CHEMTREC then set up a phone link between ATSDR, Arkansas Dept. Of Public Health, and a chemical responder from Rhone-Poulenc Chemical, which had some product in the warehouse. During this conference call, ATSDR learned that the medical center that had been evacuated was estimated to be within 1 block of the fire. The local authorities had ordered a 3 mile radius of the plant be evacuated. Air monitoring using photo-ionization detectors (PID) and flame-ionizaiton detectors (FID) was in progress in the community. As of 9:45 pm, the fire continued to burn.

The State Health Dept. requested a consultation on: what were acceptable exposure levels for the populations; when could evacuees be allowed back to their homes or the hospital; and can the food be consumed. Inconsistent readings from the air monitoring devices ranged up to 650-700 ppm on the meters, but never consistently together. Based on the concentration and the inconsistency, ATSDR recommended that the evacuees remain out of the homes and hospital until better data becomes available. At that point, the State Epidemiologist requested on-site support from ATSDR.

ATSDR began capturing data and preparing it for use in the field. At 2:00 am, CHEMTREC called with an updated list of compounds known to be on site, but not known to be involved in the fire. These included:

Azinophos methyl (guthion)
Lanate (methomyl)
Benlate (benomyl)

Premise
Aliette les
Procure
Couple of Elf Atochem products

The on-site response team departed on the next flight out of Atlanta and arrived at the County Emergency Operations Center at approximately 10:00 am.

ATSDR convened a consultation team and began analyzing the available information on the compounds involved. All compounds were identified as either organophosphate or carbamate pesticides with similar health effects; guthion was the most toxic of the compounds based on the available studies. Depending on the efficiencies of combustion, what is on fire versus what is being heated, atmospheric conditions, and the amount of oxygen available to the combustion process, the estimated decompostion products would be oxides of carbon, phosphorous, nitrate, and sulfur as well as some of the parent compounds. The bulk of the plume would consist of soot from the burning carbon. The smoke would be expected to be very irritating. Sensitive populations would be those individuals with pre-existing cardio-pulmonary conditions and infants under ~6 months old. Cholinesterase blood tests, common upon organophosphate and carbamate exposure, may not be revealing for women in the first trimester of pregnancy because the cholinesterase is depressed anyway. A guthion specific urinary biomarker was identified.

The consultation team was concerned about the firefighting water runoff as it was believed that this plant on the Mississippi River flood plan may be close to area groundwater supplies. ATSDR felt that groundwater wells should be tested. In response to the food issue, the recommendations made to Kroger on 5/8/97 were endorsed. For individual homes, the consensus was that if soot was apparent on the dwelling, the home smelled of smoke, or if the resident experienced any irritation due to the smoke, exposed foods ought to be disposed of. Otherwise, no health problems would be expected. Because the news media was reporting the evacuation had been lifted, the consultation team did not address the other two questions of the health dept.

The news media also reported that preventative antidotes were being administered to the public and firefighters. Upon ATSDR's subsequent inquiry, it was determined that no antidote was given to any asympomatic individuals. One firefighter was known to be atropinated. ATSDR recommended that individuals concerned about their exposure or symptomatic should be tested for the biomarker. If positive, then cholinesterase levels in the blood should be monitored.

IV. PLANS AND RECOMMENDATIONS

Continue to support the State Health Department at the scene and assist in coordinating health activities with the environmental response of the FOSC.

V. STATUS

On-site support continues.

BPS CHEMICAL FIRE
HELENA, AR
SITREP as of 5/10/97

SUBJECT: Situation Report (SITREP) Two, BPS Pesticide Fire, Helena, Phillips County, AR

FROM: Emergency Response Coordinator, Emergency Response and Scientific Assessment Branch (ERSAB), Division of Toxicology, ATSDR (E57)

TO: Jim Holler
Chief, ERSAB (E29)

THRU: Chief, Emergency Response Section ____

I. SITUATION

On May 8, 1997 at approximately 1:00 pm Central Time, a fire broke out in a container of methyl azinphos (guthion) at a chemical repackaging facility in Helena, AR. Helena is a small to mid-size community approximately 80 miles south of Memphis, TN on the banks of the Mississippi River. Local firefighters responded to the scene and extinguished the blaze, but a reflash occurred at about 3:00 pm. As the initial entry team from the Helena Fire Dept. approached the building, an explosion occurred collapsing a cinder block wall on the entry team. Subsequent reports indicated that three firefighters in the entry team were killed and a fourth is missing. An estimated 23 additional persons were injured during this initial phase of the incident. A three mile area was evacuated, including a 75 bed hospital with approximately 44 patients. 12 of the patients were in acute care.

EPA Region VI received notification from the National Response Center about 40 minutes before ATSDR did at 4:00 pm. Beginning at 6:45 that evening, ATSDR began receiving calls from the evacuated area. The Arkansas State Epidemiologist requested on-site assistance from ATSDR at approximately 10:00 pm, 5/8/97. An ATSDR response team consisting of Emergency Response Coordinators S. Wright and R. Zabrocki arrived on scene at the Phillip County Emergency Operations Center at approximately 9:30 am, 5/9/97.

II. CONTACTS MADE

Donald R. Gentry, Phillips County Judge, Helena, AR
James Miller, Engineer, Division of Health Facilities, AR DOH
Bruce Redinger, Architect, Division of Health Facilities, AR DOH
Mike Cunningham, Phillips County EOC, Helena, AR
Shirley Hicks, Administrator, Phillips County Health, Helena, AR
Cheryl Anthes, Nurse, Community Health, Phillips County
Sue Castell, AR DOH
Mike Watts, AR DOH
Bill Teer, Director, Division of Sanitarian Services, AR DOH
Charles Maggio, Coordinator, Search & Rescue, Phillips County
James Duffy, Sanitarian Supervisor, AR DOH, Forrest City, AR
David Bellew, Manager, HAZMAT, Office of Emergency Services, AR
Ky Nichols, OSC, EPA

Mike Ryan, OSC, EPA
Lon Biasco, OSC, EPA
Steve Reeder, Administrator, Helena Regional Medical Center (HMRC)
Betsy Arnold, Director of Laboratory, Safety/Infection Control, HMRC
Richard Cox, Director of Plant Operations, HMRC
Angela Cousins, Renal Care Group, Dialysis Center
LTC Anderson, Commander, Pine Bluff Chemical Arsenal, AR
Ronald Wise, Chief, Laboratory, Pine Bluff Chemical Activity, AR
Dr. McChesney, State Epidemiologist, AR DOH
Michael Isner, Sr. Fire Investigator, NFPA, Quincy, MA
Bill Hubbs, Manager, Emergency Response, Rhone-Poulenc, RTP, NC

III. ACTIONS TAKEN

ATSDR ERCs Wright and Zabrocki departed Atlanta Hartsfield on May 08, 1997 at 7:00AM EST and arrived on-site in Helena, AR at 9:30AM CST. Initial contact was with the Phillips County Judge, who directed us to the County EOC. ATSDR established contact with representatives with the Arkansas DOH, Mike Watts and Sue Castell. The primary community concerns were re-occupation of the Medical Center and decontamination of food product and environmental surfaces.

ATSDR contacted the local pediatrician and provided him with instructions on how to clean his medical office. ATSDR then proceeded to the federal EOC located at the Cedar Chemical plant located next to the BPS facility where EPA/OSC Nichols and EPA/OSC Mike Ryan were met. A meeting of industrial representatives, EPA, and other on-scene responders was held after ATSDR arrived. EPA OSC stated that the focus of the operations were to open the hospital and suppress the fire.

An entry had been made into the hot zone. The fire was contained but still in progress. Runoff water from the fire suppression activities was contained on site. EPA had 5 large fractionation tanks on site and were bringing in an additional 10 -20 tanks.

From there, ATSDR proceeded to the Helena Regional Medical Center with the ARDOH representatives. The opening of the facility was discussed with the hospital personnel.

Additional visual surveys were completed of the Department of Human Services and the Helena Regional Dialysis Center. These facilities were adjacent to each other. The Dialysis Center was opening while the Human Services was closed. An EPA contractor was completing a screening survey using Draeger tubes SO2, mercaptan, NO2, H2S, HCl, CN, petroleum hydrocarbons, and hydrocyanic acid. All tubes were non-detect.

Contacted Dr. McChesney, ArDPH concerning a citizen's call about the of the local Little League ball fields. Although the ball fields were probably a sufficient distance away from the fire and predominantly upwind of the fire, ATSDR recommended that they water the fields before the game with sprinklers as a precaution.

We returned to the medical center and re-evaluated the opening options. Environmental monitoring of the facility completed using a PID and an FID were non-detect. Air samples drawn from 6 areas in the medical center for analysis by the Army were non-detect for azinophos-methyl.

Contacted the EPA/OSC the morning of May 09. The OSC requested ATSDR assistance with site safety at the facility.

IV. PLANS AND RECOMMENDATIONS

Environmental cleanup procedures were:

Wash visible contamination off hard surfaces with a solution of detergent and water using rubber gloves.

Water the lawns and wash the automobiles to rid them of any particulates.

Food:

Dispose of any food left out during the evacuation.

Dispose of food with visible soot particles.

Wash off canned goods using the environmental surfaces cleaning procedures.

Refrain from eating garden produce for two days and wash thoroughly before consuming.

If in doubt throw it out.

Pets:

Any animals left outside during the incident should be bathed.

Medical Center Re-opening:

Ventilate the center by opening exterior exits and continue running the HVAC for four hours.

Complete air monitoring. If no problems proceed to next step.

Initiate clean-up of the facility (24-48 hour process). Replace the HVAC filters as soon as they arrive from the manufacturer. Clean rooms from the ceiling to the floor.

Wash all linens, towels, bedsheets and drapes which were exposed.

Re-occupy the center with patients.

V. STATUS

The medical facility is in the clean-up phase.

The ARDOH personnel have departed for Little Rock.

The ATSDR function has shifted from the medical facility issues to the on-scene site safety.

BPS CHEMICAL FIRE
HELENA, AR
SITREP as of 5/11/97

SUBJECT: Situation Report (SITREP) Three, BPS Pesticide Fire, Helena, Phillips County, AR

FROM: Emergency Response Coordinator, Emergency Response and Scientific Assessment Branch (ERSAB), Division of Toxicology, ATSDR (E57)

TO: Jim Holler
Chief, ERSAB (E29)

THRU: Chief, Emergency Response Section

I. SITUATION

On May 8, 1997 at approximately 1:00 pm Central Time, a fire broke out in a container of methyl azinphos (guthion) at a chemical repackaging facility in Helena, AR. Helena is a small to mid-size community approximately 80 miles south of Memphis, TN on the banks of the Mississippi River. Local firefighters responded to the scene and extinguished the blaze, but a reflash occurred at about 3:00 pm. As the initial entry team from the Helena Fire Dept. approached the building, an explosion occurred collapsing a cinder block wall on the entry team. Subsequent reports indicated that three firefighters in the entry team were killed. An estimated 23 additional persons were injured during this initial phase of the incident. A three mile area was evacuated, including a 75 bed hospital with approximately 44 patients. 12 of the patients were in acute care. At the request of the Arkansas Health Dept., ATSDR began on-site assistance at approximately 9:30 am, 5/9/97.

Due to early morning readings on detection instruments for cyanide at the frac tanks, the EPA Command Post was relocated to the Cedars Chemical Co., approximately 0.5 miles downwind from the site. The fire seems to be continuing to smolder with some possible chemical reactions. The fourth firefighter reported missing in the initial explosion was found recovering in an area hospital.

II. CONTACTS MADE

Same as in previous SITREPS and including:

Craig Carroll, EPA OSC, Region VI, Dallas, TX
Steve Mason, EPA/CEPPO, Region VI, Dallas, TX
Awilda Fuentes, EPA HQS/CEPPO, Washington, DC
Mike Marshall, OSHA HQS/Health Response Team (HRT), Washington, DC
Allan Heins, OSHA, Salt Lake City Technical Center, UT
Maxine Lapierre, EPA/START, Region VI, Dallas, TX
Bobby Gunter, CIH Consultant, Hartford Insurance, Atlanta, GA
Eddie Smith, Unified Investigations & Sciences, Norcross, GA

III. ACTIONS TAKEN

ATSDR, EPA and OSHA personnel re-convened in the Best Western hotel to to start the fire investigation and to discuss the chemical aspects of

the CN generation and the origin of the continuing flare-up at Unit 2.

The proposed options for fighting the fire in Unit 2 is as follows:

1. remove outer wall and pump sand via auger onto the pile and smother the fire.

2. inject with a stinger nozzle liquid carbonic (CO2) into the source.

3. remove outer wall and pump sodium carbonate (NACO3) via auger onto the fire.

4. inject oxygen via a compressor to enrich the fire thereby hastening the consumption of the materials burning.

As of this Sitrep option 1 is the selected method.

At the request of the EPA/OSC, ATSDR downloaded all the available data about the current list of chemicals, and ATSDR HQS developed a matrix which examined the reactivities/incompatibilities (attached), as well as the potential sources of fire and explosion at Unit 2.

Helena Regional Medical Center (HRMC)provided computer support, as well as the necessary photocopying and duplication services which were essential in providing seven copies of the almost 300 pages of chemical/toxicology data to EPA, OSHA, and HRMC.

HRMC has completed the replacement of all the air handling filters, brought in new food service materials, and were well into the scrubdown phase of the decontamination process.

IV. PLANS AND RECOMMENDATIONS

ATSDR will meet with the Operations and Planning Sections of the Incident Command System (ICS) to discuss the ATSDR chemical reaction matrix.

V. STATUS

Continue to provide on-site assistance as requested.

BPS CHEMICALS REACTIVIES

Inventory Name	Also Called/Active Ingredient	Vol. (Lbs.)	Molecular Formula	Reacts with	Comments
Azinphos-methyl	Guthion	30K	$C_{10}H_{12}N_3O_3PS_2$	Pyrethroids (tox. syngerism) & oxidizers	Product burned 5/8.
Topsin	Thiophanate	30K	$C_{14}H_{18}N_4O_4S_2$	No Data	
Aliette		50K	$C_6H_{18}O_9P_3$ - Al	Alkaline Fertilizers	
Lannate	Methomyl	60K	$C_5H_{10}N_2O_2S$	Bases	
Premise	15 separate formulations with that name	Unk.	Mix of OP, Carbamates, & Pyrthrins		
Procure	Triflumizole	20K	$C_{15}H_{15}ClF_3N_3O$		
Sevin	Carbaryl	5K	$C_{12}H_{11}NO_2$	Alkaline Pesticides & Oxidizers	May produce cyanides
Signature	**Sodium Hypochlorite**	**3K**	**NaClO**	**Strong Oxidizer that reacts violently with nitrates and hydrocarbons**	**May be initiating current reactions**
Maneb		**1K**	$C_4H_6MnN_2S_4$	**Spontaneously Combustible; Water reactive; decomposes violently at 100 C.**	**May be initiating current reactions; possible cause of explosion; may have burned on 5/10**
Penncozeb	**Mancozeb**	**Unk.**	**$C_4H_6MnN_2S_4$ mixed with $C_4H_6N_2S_4Zn$**	**Heat & moisture; otherwise similar to Maneb**	**May be initiating current reactions.**

Inventory Name	Also Called/Active Ingredient	Vol. (Lbs.)	Molecular Formula	Reacts with	Comments
CR Blend	39 Compounds with CR in name; 3 Pesticides are Carbofuran-based (2) or Warfarin-based (1)	200	Carbofuran: $C_{12}H_{15}NO_3$ or Warfarin: $C_{19}H_{16}O_4$	Similar reactivities: oxidizers & alkalines	Carbofuran may produce cyanide
Powicil		2K	----------NO---------	----------DATA----------	----------
Terinil		200	----------NO---------	----------DATA----------	----------
Lorsban	Chlorpyrifos	1K	$C_9H_{11}Cl_3NO_3PS$	Acids, Caustics, & Amines	

INTERIM ANALYSIS

Products of reaction and/or thermal decomposition include oxides of phosphorous, nitrogen, carbon, and sulfur, inorganic chlorine compounds (e.g., Cl, HCl, HClO, etc.), ammonia and amines possibly; cyanides and hydrogen cyanide primarily from Sevin and, if present, the Carbofuran (Furadan) formulations of CR blend. The initiators of most reactions would be the Maneb and/or Penncozeb or the Signature, as they are reactive with almost all the other compounds. If these three compounds can be removed from the pile, it is our belief that most reactions will cease. The violent decomposition of Maneb (and possibly Penncozeb) at 100 degrees C may have contributed to the explosion. The remaining compounds could form a significant amount of nitrate/nitrite in solution, resulting in the low pH of the firefighting runoff.

Additional information should be obtained on the Powicil and Terinil compounds, no data was available on these compounds. There are 39 compounds in the CC Info data base with CR as a component of the name, but only 3 seem to be registered pesiticides. Further clarification on the formulation of the CR blend would be advisable as some of the other 36 compounds are chromate and dichromate compounds, usually significant oxidizers. There are 15 pesticides with Premise in their name. They are various mixtures of carbamates, organophosphates, and pyrethroid (both synthetic and natural) pesticides; overall, they would be expected to conform to the other carbamates and O.P.s already known to be present. However, there may be subtle but significant differences in their molecular structure, which would affect whether we are dealing with- for instance - nitrates, cyanides, or amines.

BPS CHEMICAL FIRE

HELENA, AR

SITREP as of 5/12/97

SUBJECT: Situation Report (SITREP) Four and Final, BPS Pesticide Fire, Helena, Phillips County, AR

FROM: Emergency Response Coordinator, Emergency Response and Scientific Assessment Branch (ERSAB), Division of Toxicology, ATSDR (E57)

TO: Jim Holler
Chief, ERSAB (E29)

THRU: Chief, Emergency Response Section

I. SITUATION

On May 8, 1997 at approximately 1:00 pm Central Time, a fire broke out in a container of methyl azinphos (guthion) at a chemical repackaging facility in Helena, AR. Helena is a small to mid-size community approximately 80 miles south of Memphis, TN on the banks of the Mississippi River. Local firefighters responded to the scene and extinguished the blaze, but a reflash occurred at about 3:00 pm. As the initial entry team from the Helena Fire Dept. approached the building, an explosion occurred collapsing a cinder block wall on the entry team. Subsequent reports indicated that three firefighters in the entry team were killed. An estimated 23 additional persons were injured during this initial phase of the incident. A three mile area was evacuated, including a 75 bed hospital with approximately 44 patients. 12 of the patients were in acute care. At the request of the Arkansas Health Dept., ATSDR began on-site assistance at approximately 9:30 am, 5/9/97.

The CP was relocated from the Cedar Chemical business office back to the BPS facility in Unit 1. The fire continues to smolder. Level A entries are being completed by EPA and cleanup contractors to determine pesticide locations within the warehouse. Fire suppression efforts are on hold until further characterization of the warehouse is accomplished.

II. CONTACTS MADE

Same as in previous SITREPS and including:

Riley Porter, Mayor, West Helena, AR
Pat Sensat, Fire Chief, West Helena, AR
Chris Buehler, Failure Analysis Association, BPS Contractor
Allan Bartlo, President, BPS
Richard Bossey, EPA START Contractor

III. ACTIONS TAKEN

ATSDR met with the Operations and Planning Sections of the Icident Command System and discussed the ATSDR chemical matrix. The group is discussing the possibility of a chemical reaction initiating the fire and explosion: amounts of Alliette Signature stored near the azinophos methyl (AZM). Apparently, an unknown amount of the Alliette Signature had been spilled just before the fire /explosion. In addition, during the course of several interviews there was talk of a yellow powder being

emitted from an area near the compressor room. Also, the Alliette Signature was found to have a pH of 3.5 which could have initiated a fire with the AZM. The other suspected cause which was discussed was of a mechanical nature, that is the possibility of the air compressor causing a dust-like explosion from the AZM and/or the Alliette Signature.

IV. PLANS AND RECOMMENDATIONS

Photodocument the entire scope of the response operations as they relate to the public health.

V. STATUS

Continue to provide assistance as requested. Estimated date of termination of support: 5/14/97

Appendix D

bag was 4 cubic yards with roughly 4000 lbs of guthion. ATSDR confirmed again that only one symptomatic firefighter was given atropine.

At 1630, in an attempt to contact the response team, I contacted the State EOC. Dr. McChesney asked if we knew about the ball field issue yet. When I said no, he explained that he'd been called and asked if a ballfield located about 2 miles west of the site could be used that night.

At 2135, J. Wheeler called and indicated that the State Health had contacted his wife, their coop agreement project officer to brief her. After a discussion on the antidote usage and some cleanup issues, John indicated that the state believes the winds were primarily blowing from the west to the east durin the fire. The runoff had been contained, but some concern existed about percolation into the groundwater.

Action Required/Recommendations/Info Provided:

At 0835, I arrived in the office. The response team had left three questions needing answers. I began printing out information, and scheduled a consultation team meeting to go over the data. I then sent an email notification to ATSDR Region IV advising them of this situation across the Mississippi River from their area.

At 0900, I indicated to Dr. McChesney that our response team will probably be arriving on scene within the hour, perhaps an hour and half, depending on their flight. I was pretty sure they would head for the CP first and then the EOC unless some other agreement had been made. I have not heard from the scene this morning, so I don't know what media events had been planned; best way to find that out would be to contact the scene or contact our response team and have them find out when they arrived. I then gave him a pager number to our response team. After the call, I continued to prepare for the on-site support.

At 0915, I indicated that I could send the information that was downloaded overnight based on the preliminary indications of what was burning. By 0930, I was in the process of attaching the materials to the email to FEMA. The Consultation Team was gathering. At 0940, I indicated the email to FEMA was gone; a response team should be arriving at the scene soon if it isn't already there; and, I was late for the consult team meeting . If I needed help later, I would call them back.

At 0950, the consultation team of J. Wheeler, J. Little, H. Hansen, S. Kess, H. Pohl, and C. Tylenda began a review of the information available to us at the time. The discussion stopped whenever the CNN report on the incident was broadcasted and a videotape of the CNN report was made for more leisurely reviews. Based on the fact that CNN was reporting residents returning to their homes, our consensus was that the levels of health concern for the constituents of the plume were no longer an issue. Someone at the scene had already made the decision that the air concentrations were "safe." Our evaluation was that, if the fire was extinguished, this was probably valid.

Based on the presence of guthion (azinphos-methyl), thiophanate, and the methomyl, the runoff is probably more of an issue than any air emissions from the plant. The concern would not be with the

Mississippi River because the River must be nearly at flood stage flow rates. However, the typical Mississippi Alluvial plain could be threatened as the firefighting water percolated to the drinking water supply.

On the food issue, it was our consensus that the Kroger store that began ATSDR involvement and other commercial sources should consult with the FDA or other regulatory body. For private homeowner: if they smell smoke in their homes or see soot deposits on the outside or inside of the house, exposed foods should be disposed of.

Dimethylthiophosphate in urine is a biomarker specific for guthion. If the firefighters or residents are concerned about their exposure or symptomatic, a urine sample can be collected up to 3 days post-exposure to verify the exposure. Blood cholinesterase monitoring could begin with the urine sample for residents and should be done for the workers.

The consultation team was concerned about the CNN reports that antidotes were being given as preventative measure to responders and citizen, the antidote being atropine and toxic in it's own right. Sensitive populations were identified as any individual with pre-existing cardiopulmonary conditions due to the irritant nature of the smoke and infants under 6 months old due to their developing CNS system and lack of acetylcholinesterase. Women in their first trimester of pregnancy have naturally depressed acetyl cholinesterase and may therefore give a false positive indication of exposure. Wipe samples of the evacuated hospital and some homes close to the fire should be considered. At 1140, I passed this evaluation and recommendations on to the ATSDR response team.

At 1230, in response to the inquiry from DSWA, I indicated that ATSDR had a response team on site. I indicated that the Pine Bluff Arsenal had sent a team to the scene to assist the locals. Although I wasn't sure, I'm pretty sure that team was either a Technical Escort Unit or an Explosive Ordinance Disposal detachment. In either case, DSWA can probably get reports from those units faster than through us; however, I would be happy to answer any questions I could.

At 1455, after receiving the update, I began revising the SITREP for 5/8/97 and sending out updates to the consultation team. At 1545, D. Barry called and asked some questions that had not been addressed; these included the firefighters protective equipment (based on the fact that one was close enough to develop symptoms), issues for the community's healthcare providers, and citizen's concerns. I began attempts to contact the response team to find out what the response was.

At 1630, I called the State EOC and spoke with D. Snelling and Dr. McChesny. In response to the ballfield question, I indicated that the wind direction may be the answer to that issue. I believe, based on the video, that the winds were parallel to the Mississippi River and therefore the ballfield was probably crosswind to the fire; however, the folks on-scene can probably answer that question better than I.

Name: BPS Chemical
ERS LOG #: 97-3044

At 2135, I described the last update I had had from the scene and indicated that this information was in an email I'd sent at the end of the day. I guess most folks missed it. Since the only wells known to be in the area are municipal wells that are going to be sampled, I think the percolation, while a valid concern, is already being addressed.

Signature: Richard A. Nickle Richard A. Nickle Date: 05/27/97

Enclosures: Yes (X) No ( ); MIS entered: Yes (X) No ( )

cc: ATSDR Region
State HA Coop. Coord.
DHAC/PERIS
ATSDR/OFP
CDC/ERCG

1-800-424-8802

INCIDENT DESCRIPTION

*Report taken by MR FLETCHER at 14:57 on 08-MAY-97

NOTIFICATIONS BY NRC

AGCY TOXIC SUBST & DISEASE REGISTRY	MR LITTLE	
08-MAY-97 16:08		
ATSDR MS ATTN: JOE SURKIN		
08-MAY-97 00:00		(601)3546061
EPA OFFICE OF EMERG RESPONSE(OERR)		
U.S. EPA VI	MR MULLINS	
08-MAY-97 15:06		
FEDERAL EMERGENCY MANAGEMENT AGENCY	MR CANUPP	
08-MAY-97 16:02		
NOAA 1ST CLASS BB RPTS FOR AR		
08-MAY-97 00:00		(202)5266329
OCCUPATIONAL SAFETY & HEALTH ADMIN	MS CHRISTY	
08-MAY-97 16:05		
AR DEPT OF POLLUTION CONTROL		
08-MAY-97 00:00		(501)6820798
DOI/OEPC - R6		
08-MAY-97 00:00		(505)7661059
MS EMERGENCY MANAGEMENT AGENCY		
08-MAY-97 00:00		(601)3528314

ADDITIONAL INFORMATION

UPDATED AT 1550 ON 08 MAY 97 BY PO FLOYD TO INCLUDE 3 INJURIES AND EVACUATION OF AN ENTIRE HOSPITAL

***** END OF REPORT # 386556 *****

PLEASE VISIT OUR WEB SITE
http://www.dot.gov/dotinfo/uscg/hq/nrc/

05/08/97 18:30 Received beeper call from CDC switchboard.

Responded to call from Kroger Grocery in West Helena, AR. Spoke with Tim Davy (Kroger Rep) at (901)765-4115. Mr. Davy informed me that a BP pesticide plant had a fire.
According to Mr. Davy:

The fire department evacuated an area that included the store and a hospital.
The distance of the from the store to the fire was in excess of 12 miles.
The air conditioning ventilation system at the retail grocery store was shut down per request from the fire department.
The chemical azinophos-methyl was involved in the fire.

Mr. Davy was inquiring about the effects of the chemical and the smoke on the food product. I told Mr. Davy that without any data regarding the chemical concentration it would be difficult to give a definitive answer but that if the store was located 12 miles from the fire and the ventilation system was shut down quickly there was no impact on the food in the store.

I contacted Rich Nickle and discussed the shelter in place strategy. He suggested I contact Region VI EPA Emergency Response. I spoke with EPA Jim Mullins who indicated that he received the report of the incident at 3:06EST. Mr. Mullin indicated that three chemicals were thought to be involved including:

azinophos-methyl: 1-2 cubic yards
methomyl
thiophanate

There were four fatalities of fireman but it was unknown if the cause was the chemical or the explosion. Additionally Mr. Mullin indicated that a Army environmental monitoring team from Pine Bluff, an Bayer Chemical Industrial Hygienist Larry Thompson, and an EPA OSC Mike Ryan were enroute.

I updated Dave Barry who established a phone link through ChemTrec with the Larry Thompson, CARE TEAM/Bayer Chemical, who was enroute to the Kansas City airport. Mr. Thompson's report was consistent with the EPA report. Mr. Thompson indicated the West Helena Region Medical Center was evacuated and the shelter in place strategy was implemented. The fire was putting out a lot of smoke.

Larry Thompson Pager: 1-800-443-7243 PIN 050518

Chemtrec contact is Joe Deptman at 1-800-424-9300.

The Chemtrec phone connection included a conference with:

Dr. Tom McChesney, AR Dept PH Env. Epidemiologist
Comm Center @ Little Rock: (501)661-2136
Office at State Health: (501)661-2597
Home: (501)982-5697
Auditorium Comm Center: (501)280-4106 / 4107
Mr. Bill Tear, AR Dept PH Sanitarian Supervisor
Ms. Kay Dobbins, AR Dept PH Associate Director of Env Sci
Mike Forman, Ar Dept PH Laboratory Director
Bill Hubbes, ERC, Rhone Poulenc

had been evacuated.

* Evacuation was in a three mile radius of [illegible]
* Screening Monitoring was in process using FID and PID
* State on scene contact: James Duffy at pager 1-800-644-2383 pin 8014680.
* Fire still burning at 9:45PM EST.

SOOT DEPOSIT

State Health Department Questions:

1) What are acceptable exposure levels.
2) When can people reoccupy homes and hospital.
3) Can the food be consumed.

WIPE SAMPLES;

Fred Fowler, AR Dept Health, reported inconsistent air monitoring results using FID and PID. Simultaneous usage in the hospital indicated 650ppm and "low", respectively. Based on the inconsistent data ATSDR recommended that the hospital should not be reoccupied.

The Arkansas State Health Department requested ATSDR onsite assistance. Ron Zabrocki and Scott Wright will provide on-scene assistance and Rich Nickle will provide consultation team support. Ron Zabrocki provided "heads up" to Hugh Hansen, Dave Wheeler, Hana Pohl, and Rich Nickle.

05/09/97 2:00AM

Joe Deptman of Chemtrec called and provided a list of chemicals on-site but not necessarily involved, manufacturers, and BPS contacts.

Chemicals	Company
azinophos methyl	Micro Flo Florida
lanate	Dupont
benlate	Dupont
premise	Bayer
aliette les	Rhone Poulenc
procure	Uniroyal
"couple of unidentified chemicals"	Elf AtoChem

BPS contact:

Jeanie Grozes
home 870-572-9299
cell 870-338-1027
President Allan Bartlo
870-572-3084
870 is a new area code if it doesn't work use the old 50

Cedar Chemical Company may serve as a temporary base f
BPS contacts because it is located near the plant. T
phone number there is 870-572-3701

Nickle, Richard

From: Nickle, Richard
To: Barry, David
Cc: Hansen, Hugh; Holler, Jim S.; Wheeler, John; Pohl, Hana R.; Kess, Susan; Hughart, Joe; Wright, Scot Blair, Carl; Moore, Ben; Safay, Bob; Erlwein, Roberta; Lyke, Jennifer; Pettigrew, George
Subject: BPS Chemical Fire, Helena, AR
Date: Friday, May 09, 1997 4:00PM

Scott and Ron called a few moments ago. The fire is out and a survey of the warehouse about 1500 EDT reviewed that most of the chemical stock was intact. The fire was fed by cardboard and pallets stored in the warehouse. The only chemical significantly involved was the guthion. The guthion was contained in a 4 cubic yard polypropylene bag (similar to those we used to use to store dioxin dirt in Eastern Missouri). The estimated weight in the bag was about 4000 pounds. These bags are now DOT approved shipping containers for inside trailers and boxcars, by the way. This facility was a "job shop" used to break the products down into consumer product size.

Most of the health issues have been addressed. The state health commissioner will approve the re-opening of the hospital using criteria agreed to with environmental authorities, ATSDR, and State Health. Essentially, ventilation system filters will be changed, the hospital will be vented to the air for 4 hours and then air samples will be collected. After analysis, the filters will be changed again and workers will be allowed back in with the patients following 24 hours later. The hospital is located 2.5-3 miles away from the site and was upwind during most of the incident.

The runoff water from the fire was contained within the facility's wastewater system. It will be sampled and recovered into portable tanks pending disposition based on the samples. Local authorities indicate that there are no private wells in the vicinity; the water table is approximately 600 feet deep. There is a deep and impermeable clay lens under the facility; however, the muncipal wells which draw from below the lens will be sampled.

Food issues were dealt with by the sanitarians on scene from ArDPH and ATSDR and covered the gambit from hot food to cold food serving areas, food storage, and exposed foods. As stated previously and despite media reports otherwise, the only atropine administered was to a symptomatic firefighter. There were approx. 30 others, who reported irritation from the smoke, but none were admitted. ATSDR anticipates the return of the response team no later than 5/11. SITREP will follow.

Nickle, Richard

From: Nickle, Richard
To: Wheeler, John; Pohl, Hana R.; Hansen, Hugh
Cc: Hanley, G. Douglas (Doug); Allred, Michael; Kess, Susan; Tylenda, Carolyn; Barry, David
Subject: BPS Chemical Fire, Helena, AR
Date: Friday, May 09, 1997 9:13AM

Good morning. Scott and Ron left this morning, at the request of AR Health, to provide on-scene support at this pesticide warehouse fire. They should get there sometime around lunch, our time. As some of you know, we had 4 deaths, 3 injuries, and a 3-mile evacuation including the community's hospital with 12 acute care cases.
News reports last night indicated private citizens and firefighters were given antidotes as a precaution.

I will be printing off the information downloaded last night by Ron before he vamoosed and maybe getting some more stuff from other places. I'd like to get together around 9:30 or 9:45 in our conference room to go over it and see what we're facing.

For the cc: if you would be interested in attending our session, you're welcome as long as room and air changes last.

Rich

Nickle, Richard

From: Safay, Bob
To: Nickle, Richard
Subject: BPS Pesticide Fire, Helena, AR
Date: Friday, May 09, 1997 10:28AM

Heard it on the news....did not sound to good. Three firemen dead from exposure to chemical fumes....please keep me informed. bob

---

REPLY FROM: Safay, Bob
Microsoft Mail v3.0 IPM.Microsoft Mail.Note
From: Nickle, Richard
To: Moore, Ben
Blair, Carl
Safay, Bob
Cc: Pettigrew, George
Lyke, Jennifer
Erlwein, Roberta
Subject: BPS Pesticide Fire, Helena, AR
Date: 1997-05-09 09:19
Priority:
Fixed Font: 0000
Message ID: 95C1F61C
Conversation ID: 95C1F61C

I don't know how much you've heard or are aware of this situation in Region IV; it made the local news here in Atlanta. Helena is about 80 miles south of Memphis on the River. I do not believe there has been any impact in Region IV; I will keep both regions advised as we go thru this together.

From: Nickle, Richard
To: Blair, Carl; Moore, Ben; Safay, Bob
Cc: Erlwein, Roberta; Lyke, Jennifer; Pettigrew, George
Subject: BPS Pesticide Fire, Helena, AR
Date: Friday, May 09, 1997 9:19AM

I don't know how much you've heard or are aware of this situation in Region IV; it made the local news here in Atlanta. Helena is about 80 miles south of Memphis on the River. I do not believe there has been any impact in Region IV; I will keep both regions advised as we go thru this together.

Nickle, Richard

From: Nickle, Richard
To: Bryant, Paul
Cc: Barry, David; Hughart, Joe; Erlwein, Roberta; Lyke, Jennifer; Pettigrew, George
Subject: BPS Pesticide Fire, Helena, AR
Date: Friday, May 09, 1997 9:37AM

<<File Attachment: THIOPHAN.RTE>><<File Attachment: METHOMYL.HSD>><<File Attachment: METHAZI.HSD>>

Mr. Bryant, per your request of Joe Hughart, attached are the complete HSDB data files (*.hsd) for methomyl (37 pages) and azinphosmethyl (guthion) (46 pages) as well as the RTECS data (*.rte) on Thiophanate (1 page). The files are in WordPerfect 6.1.

Hope this meets your needs.

Nickle, Richard

From: Hughart, Joe
To: Nickle, Richard
Subject: BPS Pesticide Fire, Helena, AR
Date: Friday, May 09, 1997 9:55AM

Rich: THANKS! I know you guys are busy; we'll keep out of your hair

---

REPLY FROM: Hughart, Joe
Microsoft Mail v3.0 IPM.Microsoft Mail.Note
From: Nickle, Richard
To: Bryant, Paul
Cc: Barry, David
Pettigrew, George
Lyke, Jennifer
Hughart, Joe
Erlwein, Roberta
Subject: BPS Pesticide Fire, Helena, AR
Date: 1997-05-09 09:37
Priority:
Message ID: 8BFD442F
Conversation ID: 8BFD442F
Attachments:
METHAZI.HSD
METHOMYL.HSD
THIOPHAN.RTE

<< THIOPHAN.RTE : 2367 in THIOPHAN.RTE >><< METHOMYL.HSD : 2366 in METHOMYL.HSD >><< METHAZI.HSD : 2365 in METHAZI.HSD >>

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Hope this meets your needs.

Nickle, Richard

From: Hughart, Joe
To: Nickle, Richard
Cc: DeRosa, Chris; Holler, Jim S.; Johnson, Barry; Buynoski, George; Bashor, Mark
Subject: FEMA Request for Information on AR Fire
Date: Friday, May 09, 1997 2:09PM

FEMA HQ sends their thanks for your gracious assistance in providing them with information on the 3 pesticide fire chemicals. Very well done! FEMA HQ requests additional information about the percentage of filler (inert materials) in each of the products so that they can estimate the percentages of hazardous substances in smoke released from the facility with their computer programs. If that info is available, please pass on when you can. FEMA POC is Paul Bryant (202) 646-3607, email paul.bryant@fema.gov

Thanks again for your outstanding assistance to FEMA.

Nickle, Richard

From: Nickle, Richard
To: Hughart, Joe
Cc: Bryant, Paul; Barry, David; Zabrocki, Ronald D.; Wright, Scott V
Subject: RE: FEMA Request for Information on AR Fire
Date: Friday, May 09, 1997 2:32PM

Joe, the only way to get the additional information requested is thru the MSDS at the scene. I've copied Scott and Ron who are our folks down there and I will request they fax the information when I get a chance to talk to them again today. However, it may be later in the weekend before we have it in hand.

From: Hughart, Joe
To: Nickle, Richard
Cc: DeRosa, Chris; Holler, Jim S.; Johnson, Barry; Buynoski, George; Bashor, Mark
Subject: FEMA Request for Information on AR Fire
Date: Friday, May 09, 1997 2:09PM

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Thanks again for your outstanding assistance to FEMA.

Nickle, Richard

From: Hughart, Joe
To: Nickle, Richard
Subject: RE: FEMA Request for Information on AR F
Date: Friday, May 09, 1997 2:41PM

ok thanks

REPLY FROM: Hughart, Joe
Microsoft Mail v3.0 IPM.Microsoft Mail.Note
From: Nickle, Richard
To: Hughart, Joe
Cc: Barry, David
Zabrocki, Ronald D.
Wright, Scott V
Bryant, Paul
Subject: RE: FEMA Request for Information on AR Fire
Date: 1997-05-09 14:32
Priority:
Fixed Font: 0000
Message ID: C2D31BAB
Conversation ID: C2D31BAB

Joe, the only way to get the additional information requested is thru the MSDS at the scene. I've copied Scott and Ron who are our folks down there and I will request they fax the information when I get a chance to talk to them again today. However, it may be later in the weekend before we have it in hand.

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To: Nickle, Richard
Cc: DeRosa, Chris; Holler, Jim S.; Johnson, Barry; Buynoski, George; Bashor, Mark
Subject: FEMA Request for Information on AR Fire
Date: Friday, May 09, 1997 2:09PM

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of hazardous substances in smoke released from the facility with their computer programs. If that info is available, please pass on when you can.

FEMA POC is Paul Bryant (202) 646-3607, email paul.bryant@fema.gov

Thanks again for your outstanding assistance to FEMA.

Nickle, Richard

From: Nickle, Richard
To: Bryant, Paul
Cc: Barry, David; Hughart, Joe
Subject: BPS Chemical Fire, Helena, AR
Date: Friday, May 09, 1997 4:04PM

According to the MSDS just received here, the guthion (methyl azinphos) mixture was a 50/50 mix; the thiophanate was 30% inactive ingredients; the methomyl (lannate) was 10% inactive. However, post fire entry into the destroyed warehouse indicates that only the guthion was significantly involved in the fire. The remaining chemicals in the warehouse were largely undamaged by the fire and in intact containers.

Hope this meets your needs.

Nickle, Richard

From: Nickle, Richard
To: Hughart, Joe
Subject: FW: Warning: could not send message for past 4 hours
Date: Friday, May 09, 1997 4:32PM

You said FEMA got their stuff, right?

From: Mail Delivery Subsystem
To: ran2
Subject: Warning: could not send message for past 4 hours
Date: Friday, May 09, 1997 2:10PM

<<File Attachment: THIOPHAN.RTE>> <<File Attachment: METHOMYL.HSD>> <<File Attachment: METHAZI.HSD>>
This is a MIME-encapsulated message

--OAH04233.863201415/fema.gov

```
**********************************************
**      THIS IS A WARNING MESSAGE ONLY      **
**  YOU DO NOT NEED TO RESEND YOUR MESSAGE  **
**********************************************
```

The original message was received at Fri, 9 May 1997 09:37:10 -0400 (EDT)
from cdc4.cdc.gov [158.111.3.26]

----- The following addresses had transient non-fatal errors -----
Paul_Bryant@itsc.fema.gov
(expanded from: <Paul.Bryant@Fema.gov>)

----- Transcript of session follows -----
Paul_Bryant@itsc.fema.gov... Deferred: Connection timed out with itsc.fema.gov.
Warning: message still undelivered after 4 hours
Will keep trying until message is 5 days old

--OAH04233.863201415/fema.gov
Content-Type: message/delivery-status

Reporting-MTA: dns; fema.gov
Arrival-Date: Fri, 9 May 1997 09:37:10 -0400 (EDT)

Final-Recipient: RFC822; <Paul.Bryant@Fema.gov>
X-Actual-Recipient: RFC822; Paul_Bryant@itsc.fema.gov
Action: delayed
Status: 4.4.1
Remote-MTA: DNS; itsc.fema.gov
Last-Attempt-Date: Fri, 9 May 1997 14:10:15 -0400 (EDT)
Will-Retry-Until: Wed, 14 May 1997 09:37:10 -0400 (EDT)

--OAH04233.863201415/fema.gov
Content-Type: message/rfc822

Return-Path: <ran2@ATSDHS2.EM.CDC.GOV>
Received: from cdc4.cdc.gov (cdc4.cdc.gov [158.111.3.26])
        by fema.gov (8.8.5/8.8.5) with ESMTP id JAA01726
        for <Paul.Bryant@Fema.gov>; Fri, 9 May 1997 09:37:10 -0400 (EDT)
Received: from SmtpOut.em.cdc.gov (smtpout.em.cdc.gov [158.111.3.16])
        by cdc4.cdc.gov (8.8.5/8.8.5) with SMTP id JAA03277
        for <Paul.Bryant@Fema.gov>; Fri, 9 May 1997 09:39:00 -0400 (EDT)

Nickle, Richard

From: Nickle, Richard
To: Zabrocki, Ronald D.
Cc: Wright, Scott V; Barry, David
Subject: BPS Chemical Fire, Helena, AR
Date: Friday, May 09, 1997 6:18PM

<<File Attachment: BPS-CHEM.SR1>>

I finally got your SITREP rewritten in our standard format. Please review it to make sure it makes sense and reflects things up to the point where you and I talked today (about 1040 your time on scene, 5/9/97). Make any edits and send it back to us in Atlanta as soon as possible as I have had a couple of requests for one from outside the section. I stopped there because, at that point, the focus seemed to shift to y'all.

You could do SITREP 2 by changing the "as of" date in the header and then adjusting the subject line by replacing "one" with "two" - or, as is likely "two and final" so's folks will know not to expect any more SITREPs.

The Situation paragraph should reflect how things stand and briefly how they got that way as you write the SITREP. The contacts made section should include significant folks you talk to that day that materially affected the situation. The action taken section should list whatever you did that day that was significant and - real briefly - the justification for your actions. There are supposed to be AROAs that give the details. The plans section should list what you intend to do, what issues may come up, and what you want us in Atlanta to do for you the next day. The status section just lets us know whether you think it's over or perhaps when you think it will be over, If any SITREP covering just one single day after the first one is longer than 2 pages, you're probably putting too much stuff in the SITREP. The SITREP is supposed to answer the questions of all those folks who might be interested in what we're doing, but whom we don't want to brief 5 or 10 times every day.

Name: BPS Chemical
ERS LOG #: 97-3044

ATSDR Record of Activity

ROUTING:
J. Holler D. Barry
H.Hansen H.Pohl
J. Wheeler ERS FILES

UID #: RAN2 Date: 05/10/97 Time: 1140 am X pm _

Site Name: BPS Chemical Fire City: Helena Cnty: Phillips State: AR

CERCLIS #: _____ Cost Recovery #: A336 Region: 06

Site Status (1) _ NPL X Non-NPL _ RCRA _ Non-Site specific _ Federal
(2) X Emergency Response _ Remedial _ Other:

Activities

X Incoming Call	_ Public Meeting*	X Health Consult*	X Site Visit*
X Outgoing Call	_ Other Meeting	_ Health Referral	X Info Provided
_ Conference Call	_ Data Review	_ Written Response	_ Training
_ Incoming Mail	_ Other		

Requestor and Affiliation:(24) J. Milazzo, Controller
Phone: 800-424-9300 Address: CHEMTREC, CMA
City: Washington State: DC Zip Code: _____

Contacts and Affillation

(24) J. Stetson, BPS Chemical
(31) S. Wright, ATSDR ERC
(31) R. Zabrocki, ATSDR/ERC
(31)G. Pettigrew, ATSDR VI

1-EPA 2-USCG	3-OTHER FED	4-STATE ENV	5-STATE HLT	
6-COUNTY HLTH	7-CITY HLTH	8-HOSPITAL	9-LAW ENFORCE	10-FIRE DEPT
11-POISON CTR	12-PRIV CITZ	13-OTHER	14-UNKNOWN	15-DOD
16-DOE	17-NOAA	18-OTHR STATE	19-OTHR COUNTY	20-OTHR CITY
21-INTL	22-CITZ GROUP	23-ELECT. OFF	24-PRIV. CO	25-NEWS MEDIA
26-ARMY	27-NAVY	28-AIR FORCE	29-DEF LOG AGCY	30-NRC
31-ATSDR				

Program Areas

_ Health Assessment	_ Health Studies	_ Tox Info-profile	X Worker Hlth
_ Petition Assessment	_ Health Surveilnc	_ Tox Info-Nonprofil	_ Admin
X Emergency Response	_ Disease Regstry	_ Subst-Spec Resch	_ Other
X Health Consultation	_ Exposr Regstry	_ Health Education	

Narrative Summary:

At 1140, R. Zabrocki, ATSDR Emergency Response Coordinator on-scene, called with an update on the situation at the scene. The ATSDR response was at the hospital working on issues relative to opening that facility.

ERC Zabrocki indicated that the folks on-scene had dealt with the baseball field. They indicated that there was most likely not a problem at the field 2 miles west of the plant, but running the sprinklers on the field would be prudent.

There were no concerns about the protective equipment of the firefighters because they wore chemical protective equipment as well. The firefighter, who developed symptoms of overexposure, had not worn an SCBA and had poor hand-to-mouth discipline.

The team was not aware of any concerns from citizens so far and the health care providers have not expressed any. The team has met with the hospital administrators and all known private health professionals in the vicinity.

The cause of the fire, another concern, was currently unknown but being investigated by both OSHA and fire officials. This investigation was hampered by concern over the structural remains of the plant.

At the hospital, after the initial steps, indoor air samples were analyzed by the Pine Bluff Arsenal response team with a portable GC calibrated to azinophos-methyl (guthion). None was detected. The ventilation of the building was most effective. The staff is now doing a complete linen change throughout the facility and scrubbing down all surfaces.

Bayer Chemical has been replaced on scene by representatives from DuPont. The DuPont team is expressing concern about syngerism of the compounds and adequacy of worker protective clothing. When EPA asked for their data on the syngerism, DuPont said there was none. The EPA OSC would like ATSDR's evaluation.

At 1220, J. Milazzo of CHEMTREC, the response center for the Chemical Manufacturer's Association, called; a representative of BPS chemical called them about decontaminating homes and BPS would like to talk to ATSDR. When they tried to patch us together, communications was lost.

At 1335, CHEMTREC with J. Stetson of BPS called back re: the decon of the homes. I suggested that he contact our response team and the local health department, who were working on that problem at the hospital right now. BPS offered to share expenses on reproduction and distribution of the material. I indicated that he needed to contact the State and Local Health on the cost issues.

At 2100, ERC Wright called from his motel with an update. A fire had reflashed in one corner of the building. There was some Maneb stored in that area that may have reacted with the firefighting water. No further response operations tonight. Safety concerns was a big topic of discussion in the incident command briefing that evening with EPA describing 5 Level A entries and OSHA discussing structural integrity concerns of the building. The syngerism issue did not come up again and there were no new public health concerns raised. The State Health representatives returned to their offices after evening meeting.

Action Required/Recommendations/Info Provided:

I passed on the concerns expressed by D. Barry, our section chief (see AROA for 5/9/97), and asked the response team to call him at home. The team indicated they were having problems with getting into the ATSDR LAN, their cell phones, and their pagers, so communications will be hit or miss during the incident. I also mentioned the issues about the ball field in case they had not been contacted. When they described their actions, I concurred with them. When they described their new issue, I indicated I would check and call back later. After the initial contact with CHEMTREC, I began contacting the team and looking at interactions between the compounds known to be present.

At 1325, I contacted R. Zabrocki on site. I indicated that I was still looking at the interactions, but CHEMTREC had called about home decon. Ron indicated that the ATSDR team and Local Health were working on that issue at that moment. Discussed ammonia versus laundry detergent. At 1335, CHEMTREC called back with BPS on the line; I referred them to the response team at the hospital.

At 1345, I called H. Hansen and described the syngerism claims. I asked about chemical reactions. He indicated that, if some of the materials were heated but not burning, then hydrogen chloride and/or hydrogen fluoride may be produced and then react out. However, there should not be any other interactions between the three compounds of concern. There may be pyrolytic conversions to other products; some less toxic and others more toxic. The responders need to look for change in states (e.g., from a solid to a liquid). In order for pyrolysis to occur, then the container would have to be able to stand intense heat. The three compounds should not form shock-sensitive or more reactive compounds, but more stable compounds. Hugh's biggest concerns was uncombusted pesticides getting into the drinking water.

At 1410, H.Pohl answered my page and I described the syngerism issue. She indicated that toxic effects of the three compounds should be additive unless there is data to suggest otherwise. Because all three of the compounds (organophosphates and carbamates) have similar effects, the cumulative effect may be a little more than additive, but not syngeristic. Discussed concerns about preventative antidotes being given to responders as the media is continuing to report; no indication that any non-symptomatic person was atropinated.

At 1420, J. Wheeler called back and I described the concern. He concurred that the effects should be additive partially because none of the three compounds involved have different metabolic actions. Pyrethroids may cause a syngeristic effect with the organophosphates along with the pyrethroid common co-agent, piperonyl butoxide; however none of those compounds are known to be involved at this point. Chronic exposures to the combination may have an increased effect on the P450 enzyme, but not acute exposures; besides, the significance of that effect is unclear. I indicated that means DuPuont apparently apparently has no indication that there is a problem and we have no data to prove that there isn't.

At 1445, I called the on-site response team back. I indicated that BPS may be calling them to offer assistance in the development, distribution, and costs of the flyers for the returning homeowners. I passed on the assessment of the Consult Team on the issues raised by DuPont. Since pyrethroids are such a common consumer pesticide, then there may be a source for these compounds in the homes of

those evacuated. Briefly, I mentioned the possibility of pyrolysis, but the on-site team indicated that all the containers are plastic or synthetic fibers. These kinds of containers would not withstand the heat of pyrolysis. We also discussed PPE appropriate for the entry teams potentially exposed to organophosphates outside of their damaged containers. ACGIH indicated viton-on-neoprene or butyl-on-neoprene as the preferred suites and R. Zabrocki had indicated that TOMES recommended neoprene.

Signature: Richard A. Nickle Richard A. Nickle Date: 05/27/97

Enclosures: Yes ( ) No (X); MIS entered: Yes (X) No ( )

cc: ATSDR Region
State HA Coop. Coord.
DHAC/PERIS
ATSDR/OFP
CDC/ERCG

Name: BPS Chemical
ERS LOG #: 97-3044

ATSDR Record of Activity

ROUTING:
J. Holler D. Barry
H.Hansen H.Pohl
J. Wheeler ERS FILES

UID #: RAN2 Date: 05/11/97 Time: 1030 am X pm _

Site Name: BPS Chemical Fire City: Helena Cnty: Phillips State: AR

CERCLIS #: _____ Cost Recovery #: A336 Region: 06

Site Status (1) _ NPL X Non-NPL _ RCRA _ Non-Site specific _ Federal
(2) X Emergency Response _ Remedial _ Other:

Activities

X Incoming Call	_ Public Meeting	X Health Consult	X Site Visit
X Outgoing Call	_ Other Meeting	_ Health Referral	X Info Provided
_ Conference Call	_ Data Review	_ Written Response	_ Training
_ Incoming Mail	_ Other		

Requestor and Affiliation:(05) L. Leslie, ArDPH
Phone: 501-661-2597 Address: _____
City: Little Rock State: AR Zip Code: _____

Contacts and Affillation

(31) R. Zabrocki, ATSDR ERC ( )_____
(31) S. Wright, ATSDR ERC ( )_____

1-EPA 2-USCG	3-OTHER FED	4-STATE ENV	5-STATE HLT	
6-COUNTY HLTH	7-CITY HLTH	8-HOSPITAL	9-LAW ENFORCE	10-FIRE DEPT
11-POISON CTR	12-PRIV CITZ	13-OTHER	14-UNKNOWN	15-DOD
16-DOE	17-NOAA	18-OTHR STATE	19-OTHR COUNTY	20-OTHR CITY
21-INTL	22-CITZ GROUP	23-ELECT. OFF	24-PRIV. CO	25-NEWS MEDIA
26-ARMY	27-NAVY	28-AIR FORCE	29-DEF LOG AGCY	30-NRC
31-ATSDR				

Program Areas

_ Health Assessment	_ Health Studies	_ Tox Info-profile	X Worker Hlth
_ Petition Assessment	_ Health Surveillnc	_ Tox Info-Nonprofil	_ Admin
X Emergency Response	_ Disease Regstry	_ Subst-Spec Resch	_ Other
X Health Consultation	_ Exposr Regstry	_ Health Education	

Narrative Summary:

At 1030, ATSDR ERC R. Zabrocki, on-scene in Helena, called. He indicated the firefighting runoff water that is contained on the site has a pH of 1-2. This morning, a brief fire and reaction forced the relocation of the Command Post. The odor was mostly described as phosphorous with some

descriptions saying it was cyanide.

At 1335, I answered a page from J. Wheeler. He indicated that he had been called by Louis Leslie with AR Health; Mr. Leslie tried to get through on the 24 hour number but was unable to do so. Mr. Leslie indicated that the hospital was washing down the walls and the halls. He was concerned about contamination of disposable sterile instruments in paper packaging. John suggested I speak with a medical officer first.

At 1350, I spoke with Mr. Leslie. He indicated that the instruments were disposable but sterile. The packaging is plastic on one side and paper on all the other sides. He believes the hospital has limited sterilization equipment.

At 1540, S. Wright and R. Zabrocki indicated that they had had some difficulty getting information on the compounds. They stated that the CP had been evacuated that morning due to cyanide hits. The runoff water seems to have a pretty consistent pH of 2. The pesticide tradenames Premise contains pyrethroids.

Action Required/Recommendations/Info Provided:

Based on the presence of a fourth pesticide and a fire reported on 5/10, I asked the on-site response to fax the complete inventory of the destroyed warehouse to the office. I would assemble a consultation team there where the data could be spread out on the board and do a hazard analysis looking for reactants and syngeristic compounds. At 1040, I contacted H. Hansen and asked that he meet me at the office after giving me some time to get the data together. At 1050, I briefed D. Barry. At 1130, I arrived in the office and began accessing and downloading data on reactions, interactions, and chemical structures for the 14 compounds identified in the warehouse inventory. At 1240, H. Hansen arrived and we began looking at the data.

At 1345, I called H. Pohl and asked about the sterile equipment. She indicated the instruments should be sterilized and re-packaged; bandages and gauss should be disposed of. At 1350, I called Mr. Leslie at home.

After getting a better idea of the packaging, I indicated that the prudent action would be to dispose of all the instruments in that packaging and re-stock. However, the probability of a significant impact of the smoke plume impacting an interior room is likely minimal. One option would be to sacrifice the one package most likely to be impacted (e.g., either directly underneath the air vent or directly across from the vent) and destructively test the wrapping of the package for pesticides and acid gases. The manufacturer of the product should also be consulted. At 1355, I called H. Pohl back and briefed her on my conversation.

At 1415, I began attempts to contact the on-site response and summarizing the analysis in a table with comments (attached). At 1540, I was able to get through. Once they finished their update, I indicated that I also found out the Premise is a pyrethroid and one of the things I was going to tell them about. Cyanides could be coming from the Sevin or possibly the carbofuran formulations of CR Blend. The

initiator of most reactions would likely be the Maneb, Penncozeb, or the Signature, assuming the MSDS I found is the right Signature. If those three compounds can be safely removed from the pile, that might lead to a cessation of the reactions. No information on Powicil or Terinil was found. CR Blend is a name for 39 compounds in the CCInfo MSDS database; only 3 are pesticides. Some of the others include chromates and dichromates, so additional identification is necessary. After obtaining concurrence from H. Hansen, I faxed the reaction summary table to the on-site team and updated D. Barry.

Signature: Richard A. Nickle Richard A. Nickle Date: 05/28/97

Enclosures: Yes (X) No ( ); MIS entered: Yes (X) No ( )

cc: ATSDR Region
State HA Coop. Coord.
DHAC/PERIS
ATSDR/OFP
CDC/ERCG

ESTIMATED MATERIAL TYPE AND QUANTITIES STORED AT BPS FACILITY

Azinphos-methyl	30,000 lbs
Topsin	30,000 lbs
Aliette	50,000 lbs
Lannate	60,000 lbs
Premise	Unknown
Procure	20,000 lbs
Sevin	5,000 lbs
Signature	3,000 lbs
Maneb	1,000 lbs
Penncozeb	Unknown
CR blend	200 lbs
Powicil	2,000 lbs
Terinil	200 lbs
Lorsban	1,000 lbs

The listed quantities are estimated from interviews with BPS personnel.

Best Western 501-572-2592 Rm 232

BEST WESTERN INN
1053 Hwy. 49 West
West Helena, AR 72390

FAX COVER SHEET

DATE: 05 / 11 / 19 97

TO: Rich Nickle

PHONE: (404) 639-6360

FAX: (404) 639 - 6363

FROM: Best Western Inn

PHONE: 501-572-2592

FAX: 501-572-7561

REMARK: Number of pages including cover sheet: 3

Message

BPS CHEMICALS REACTIVIES[1]

Inventory Name	Also Called/Active Ingredient	Vol. (Lbs.)	Molecular Formula	Reacts with	Comments
Azinphos-methyl	Guthion	30K	$C_{10}H_{12}N_3O_3PS_2$	Pyrethroids (tox. syngerism) & oxidizers	Product burned 5/8.
Topsin	Thiophanate	30K	$C_{14}H_{18}N_4O_4S_2$	No Data	
Aliette		50K	$C_6H_{18}O_9P_3$ - Al	Alkaline Fertilizers	
Lannate	Methomyl	60K	$C_5H_{10}N_2O_2S$	Bases	
Premise	15 separate formulations with that name	Unk.	Mix of OP, Carbamates, & Pyrthrins		
Procure	Triflumizole	20K	$C_{15}H_{15}ClF_3N_3O$		
Sevin	Carbaryl	5K	$C_{12}H_{11}NO_2$	Alkaline Pesticides & Oxidizers	May produce cyanides
Signature	Sodium Hypochlorite	3K	NaClO	Strong Oxidizer that reacts violently with nitrates and hydrocarbons	May be initiating current reactions
Maneb		1K	$C_4H_6MnN_2S_4$	Spontaneously Combustible; Water reactive; decomposes violently at 100 C.	May be initiating current reactions; possible cause of explosion; may have burned on 5/10
Penncozeb	Mancozeb	Unk.	$C_4H_6MnN_2S_4$ mixed with $C_4H_6N_2S_4Zn$	Heat & moisture; otherwise similar to Maneb	May be initiating current reactions.
CR Blend	39 Compounds with CR in name; 3 Pesticides are Carbofuran-based (2) or Warfarin-based (1)	200	Carbofuran: $C_{12}H_{15}NO_3$ or Warfarin: $C_{19}H_{16}O_4$	Similar reactivities: oxidizers & alkalines	Carbofuran may produce cyanide
Powicil		2K	---------NO---------	----------DATA----------	----------
Terinil		200	---------NO---------	----------DATA----------	----------
Lorsban	Chlorpyrifos	1K	$C_9H_{11}Cl_3NO_3PS$	Acids, Caustics, & Amines	

INTERIM ANALYSIS

Products of reaction and/or thermal decomposition include oxides of phosphorous, nitrogen, carbon, and sulfur, inorganic chlorine compounds (e.g., Cl, HCl, HClO, etc.), ammonia and amines possibly; cyanides and hydrogen cyanide primarily from Sevin and, if present, the Carbofuran (Furadan) formulations of CR blend. The initiators of most reactions would be the Maneb and/or Penncozeb or the Signature, as they are reactive with almost all the other compounds. If these three compounds can be removed from the pile, it is our belief that most reactions will cease. The violent decomposition of Maneb (and possibly Penncozeb) at 100 degrees C may have contributed to the explosion. The remaining compounds could form a significant amount of nitrate/nitrite in solution, resulting in the low pH of the firefighting runoff.

Additional information should be obtained on the Powicil and Terinil compounds, no data was available on these compounds. There are 39 compounds in the CC Info data base with CR as a component of the name, but only 3 seem to be registered pesiticides. Further clarification on the formulation of the CR blend would be advisable as some of the other 36 compounds are chromate and dichromate compounds, usually significant oxidizers. There are 15 pesticides with Premise in their name. They are various mixtures of carbamates, organophosphates, and pyrethroid (both synthetic and natural) pesticides; overall, they would be expected to conform to the other carbamates and O.P.s already known to be present. However, there may be subtle but significant differences in their molecular structure, which would affect whether we are dealing with- for instance - nitrates, cyanides, or amines.

Name: BPS Chemical
ERS LOG #: 97-3044

ATSDR Record of Activity

ROUTING:
J. Holler D. Barry
H.Hansen H.Pohl
J. Wheeler ERS FILES

UID #: RAN2 Date: 05/12/97 Time: 1335 am _ pm X

Site Name: BPS Chemical Fire City: Helena Cnty: Phillips State: AR

CERCLIS #: _____ Cost Recovery #: A336 Region: 06

Site Status (1) _ NPL X Non-NPL _ RCRA _ Non-Site specific _ Federal
(2) X Emergency Response _ Remedial _ Other:

Activities

X Incoming Call	_ Public Meeting*	X Health Consult*	X Site Visit*
X Outgoing Call	_ Other Meeting*	_ Health Referral	X Info Provided
_ Conference Call	_ Data Review	_ Written Response	_ Training
_ Incoming Mail	_ Other		

Requestor and Affiliation:(31) R. Zabrocki, ATSDR ERC
Phone: _____ Address: _____
City: Helena State: AR Zip Code: _____

Contacts and Affillation

( )_____ ( )_____
( )_____ ( )_____

1-EPA 2-USCG	3-OTHER FED	4-STATE ENV	5-STATE HLT	
6-COUNTY HLTH	7-CITY HLTH	8-HOSPITAL	9-LAW ENFORCE	10-FIRE DEPT
11-POISON CTR	12-PRIV CITZ	13-OTHER	14-UNKNOWN	15-DOD
16-DOE	17-NOAA	18-OTHR STATE	19-OTHR COUNTY	20-OTHR CITY
21-INTL	22-CITZ GROUP	23-ELECT. OFF	24-PRIV. CO	25-NEWS MEDIA
26-ARMY	27-NAVY	28-AIR FORCE	29-DEF LOG AGCY	30-NRC
31-ATSDR				

Program Areas

_ Health Assessment	_ Health Studies	_ Tox Info-profile	X Worker Hlth
_ Petition Assessment	_ Health Surveillnc	_ Tox Info-Nonprofil	_ Admin
X Emergency Response	_ Disease Regstry	_ Subst-Spec Resch	_ Other
X Health Consultation	_ Exposr Regstry	_ Health Education	

Narrative Summary:

At 1330, ATSDR ERC R. Zabrocki, on-scene in Helena, called with an update. The Command Post had moved forward to it's original position. The fire was still smoldering in some sections of the destroyed 27,000 ft^2 warehouse. The hospital staff continued to clean the facility. ERC Zabrocki and

the staff both found debris (insulation and the like) from the initial explosion on the hospital grounds. He asked if we had received the floorplan.

On 5/13, ERS Chief D. Barry mentioned to me that he had heard from DHEP that a mental health unit was dispatched from Memphis to the scene. He asked if I knew anything about it. At 1600, ERS met briefly with DHEP staff to discuss this incident.

Action Required/Recommendations/Info Provided:

I indicated that I hadn't received a floorplan of the warehouse. I was surprised that granular pesticides had the explosive energy to send even lightweight debris 2.5 miles away, even if it was downwind at the time.

On 5/13, I indicated that I had no knowledge of a federal mental health team being involved. I speculated that, since Memphis is the home of the Central U.S. Earthquake Consortium (CUSEC), there might be crisis counseling team of some time from SAMHSA stationed there. Who would call them in or why and what they're doing is unknown. When we spoke with DHEP in the afternoon, it was still unclear.

Signature: Richard A. Nickle Richard A. Nickle Date: 05/29/97

Enclosures: Yes ( ) No (X); MIS entered: Yes ( ) No (X)

cc: ATSDR Region
State HA Coop. Coord.
DHAC/PERIS
ATSDR/OFP
CDC/ERCG